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METAL EQUIPMENT OF THE "MAURETANIA."

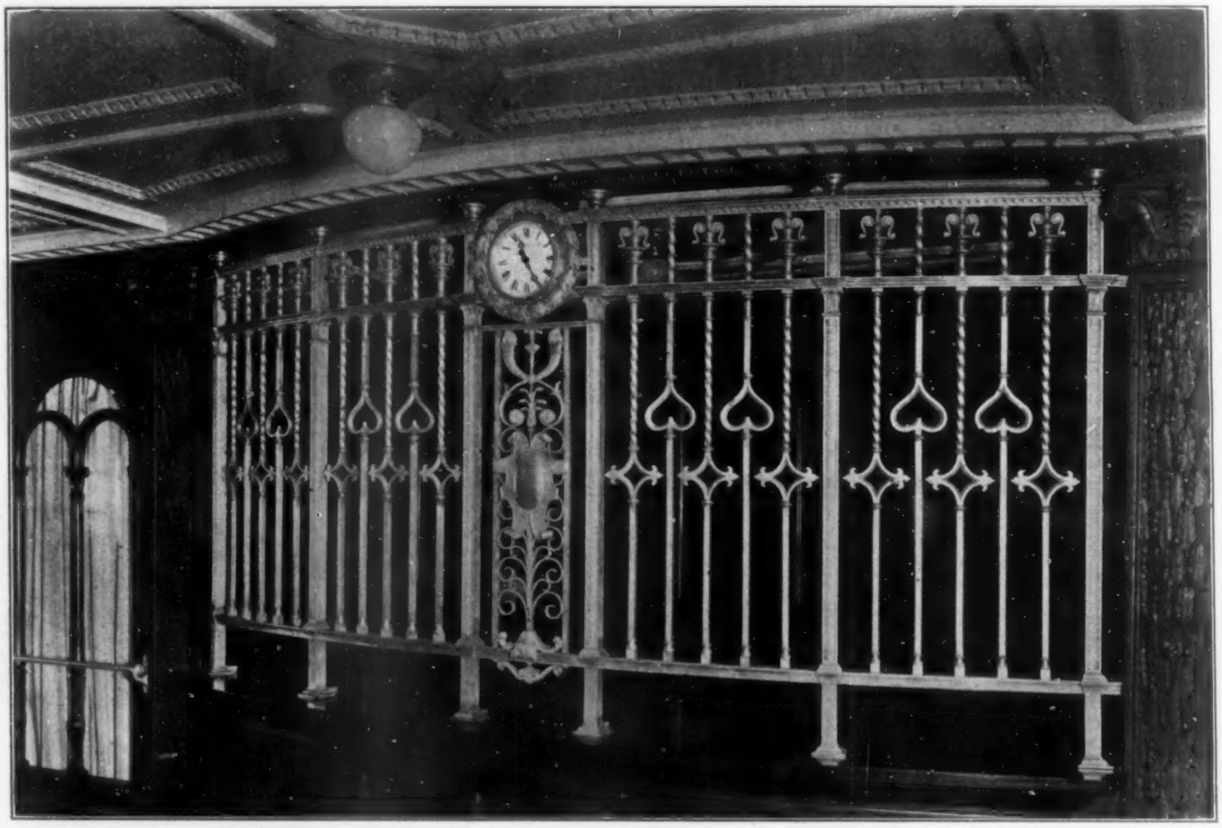
ENGINE ROOM—PROPELLERS—ALUMINUM GRILL IN PURSER'S OFFICE.

BY J. HORTON.

Some months ago* we gave a number of details from the non-ferrous metal point of view, with regard to the "Lusitania," dealing particularly with the metallic decorations, and artistic knick-knacks of the vessel. Of late, her sister ship, the "Mauretania," has also attracted public attention, and the interest in this vessel has been aroused more by her record-breaking achievements than by the gigantic size and palatial equipment, although in every respect the latter are fully equal to those of her predecessors.

The "Mauretania" is at present principally engaged in breaking her own records, and in this direction every voyage achieves something better than the one before it, she now holding the world's record for long course, 2,892 miles, between Queenstown and the Lightship of 4d. 15h. 55m., an hourly record of 25.84 knots. The eastbound record for 2,933 miles is 4d. 17h. 21m. made in June. This is an average speed of 25.88 knots. The greatest day's run, for which she also holds the record, was 673 knots.

With the object of obtaining some light on the share which her mechanical construction plays in these achievements, our Birmingham representative recently paid a visit to Liverpool while the "Mauretania" was in dock, and had a conversation with Mr. James Bain, general superintendent of the Cunard Steampship Company, who was one of those entrusted with the the task of recommending to the company the best means of propelling these leviathan steamers. The committee reported in favor of the steam turbine. To a general question as to the explanation of the "Mauretania's" success, Mr. Bain replied that it was due to the



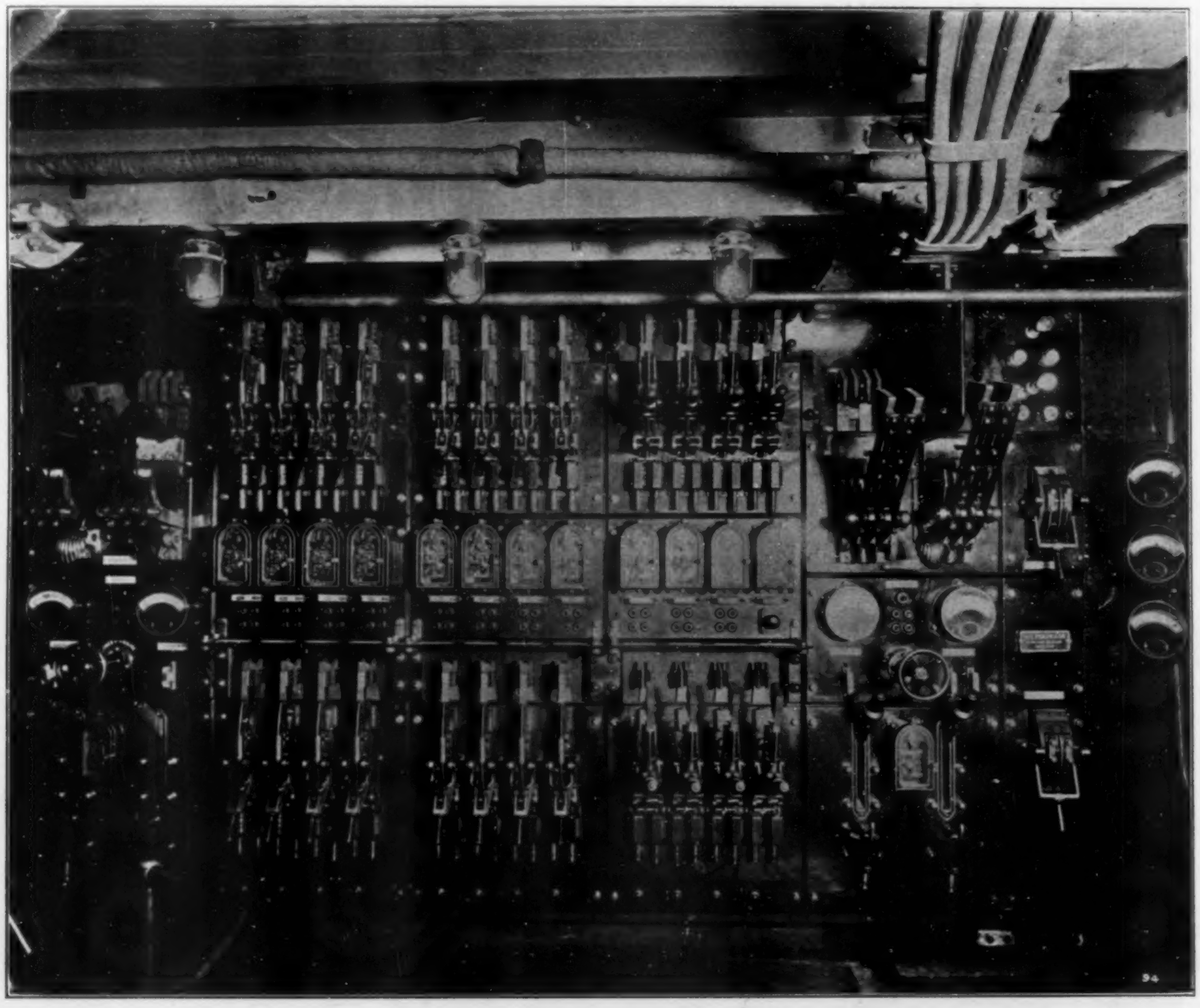
ALUMINUM GRILL IN FRONT OF PURSER'S OFFICE.

*American Edition, November, 1907.

lines of the ship, the type of engines, and the efficiency of the propellers. As to its achievements, Mr. Bain said the ship had entirely realized expectations. With regard to non-ferrous metal, Mr. Bain said that the propellers were of manganese-bronze, a metal which for many years past has given entire satisfaction to the Cunard Steamship Company. With regard to aluminium, he was disposed to agree with the complaints made at the meeting of the Institute of Metals in London, that this metal, while possessing decided advantages in its lightness, is unsatisfactory in its resistance to seawater. At the same time they had been able to utilize aluminium in the grills of the passenger lift by which they had effected a saving of twenty-five tons in weight as compared with iron and brass. The bearings are of white anti-friction metal, and have given every satisfaction.

Everyone must be by this time familiar with the gigantic construction and leviathan power of the "Mauretania," but it may be recalled that the length is 790 feet, or 115 longer than the next largest ships the "Carmania" and the "Caronia;" that the indicated horsepower totals 68,000; that the total weight of the ship is 45,000 tons, the speed per hour realized being over 25½ knots. As she lay in dock, the "Mauretania" was a striking object from the river, her big funnels, each capable of accommodating comfortably a couple of Glasgow tramcars side by side towered high above the tallest warehouses.

The aluminium grille which we show is somewhat striking in appearance, and a sufficient innovation to merit an additional word. The design is an adaptation of some sixteenth century wrought ironwork, and the lighter appearance forms a pleasant contrast to the prevalent and more sombre walnut. It is admitted, however, that the metal involved more trouble in working than either iron or bronze, owing to its peculiar greasy nature, but the difficulty was effectually overcome, and the result has entirely justified the selection of the metal.



ELECTRIC SWITCHBOARD IN AUXILIARY ENGINE ROOM.

Attention is also attracted to the judicious employment of richly chased bronze and gilt ormolu in the swing doors of the lounge and library. This metal is utilized in the narrow dividing lines between the panels of the doors. Generally speaking, the metallic decorations are of the superb artistic character so generally admired in the sister-ship, "the "Lusitania." Especially is this remark applicable to the pendant chandeliers of gilt, bronze and crystal, so cleverly arranged that although the crystals appear to hang loose, and have the light effect of such hanging, no motion of the ships disturbs them.

ENGINE ROOM.

Coming now to the engine room and its fittings,

the propellers, of course, are worthy of special attention. Considering the high speed attained, freedom from vibration must be put down as a splendid achievement.

The builders of the vessel were Messrs. Swan, Hunter, Wigham, Richardson, Ltd., who had already turned out the "Ultonia," the "Ivernia" and the "Carpathia" for the same company, while the engines were supplied by the Wallsend Slipway and Engineering Co., Ltd. The last named company have furnished machinery for six of the seven Cunard liners produced on the Northeast Coast, and it is a remarkable fact that the manager of the Wallsend Co., Mr. Andrew Laing, had a share in the building of many Cunard liners also built on the Clyde.

A great amound of time was devoted to experiments upon the design of the propellers, the result of which was the choice of a pattern possessing important differences from those commonly used. The sister ships are the first to be fitted with four propellers (see illustration). The blades also are narrower, especially at the root than is usual with turbine propellers, and it has been found that the thickness of the blades has great influence on the efficiency. It is a curious fact that the propellers proposed as most suitable by various authorities varied in efficiency as much as 12 per cent., which means that if the least efficient form had been adopted some 8,000 indicated horsepower might have been spent in excess of what is necessary. The result of a further series of experiments was to determine that the inner propellers should turn outwards.

THE FOUR PROPELLER SHAFTS FITTED WITH MANGANESE BRONZE BLADES.

It is a wonderful experience to descend into the engine rooms of these great liners, and especially to notice how every inch of space appears to have been utilized. Yet this has been done without undue crowding or impairment of efficiency. It is no small achievement, seeing that two additional screws have been provided involving four lines of shafting and propellers against the usual two, which in itself marks a great

step forward. The "Carmania" has already pointed the way to this improvement by having three screws. Space limitations render impossible the inclusion of a large amount of detail in the description of mechanical arrangement and for the most part, therefore, these must be summarized. The boilers are arranged in four rooms, the forward or No. 1 boiler room having five double-ended and two single-ended boilers, while in the others are six double-ended boilers.

Of the four propelling shafts, the two wing shafts are driven by high-pressure turbines and the two inner shafts by low-pressure turbines, astern turbines being also fitted on the latter shaft. There are three turbine compartments, those on the port and starboard side respectively having the high-pressure turbines with a central room containing the two low-pressure and astern turbines. Generally speaking, it may be said that the steam auxiliaries, comprising feed pumps, hot well, wet air, dry air, oil pumps, sanitary pumps, etc., number sixty-two, made by various engineers and all of the highest class.

The propelling machinery proper comprises six turbines, two high-pressure and two low-pressure for going ahead, and two high-pressure for going astern. The arrangements of the propellers are so made that the centres of the outer propellers are 78 ft. 11 ins. forward of the inner propellers; the two inner propellers being 12 ft. 10 ins. in advance of the after perpendicular. A great amount of experiment was made before these arrangements were finally determined upon. Everything is on a gigantic scale, the total weight of the high-pressure rotor complete being over 72 tons; of the low-pressure rotor, 126 tons, and of the astern rotor, 60 tons. The overall length of the turbine rotors, including the bearings, is, in the case of the high-pressure turbine, 45 ft. 8 in.; of the low-pressure turbine, 48 ft. 1⅞ in., and of the astern turbine, 30 ft. 1¼ in. In one rotor only of the turbines there are 50,000 blades.

Among the most interesting details of machinery construction was the blading of the turbines, in regard to which a number of experiments were carried out by Mr. Andrew Laing, the Wallsend manager. The best evidence of the efficiency of the system adopted is shown by the fact that the 50,000-blade turbine was completely bladed in fourteen days. Special machinery was devised by the Wallsend Company, by means of which the blades which are delivered in rolled brass bars are cut to lengths in one of several Taylor & Challen stamping presses. The work was done on what is known as the Parsons system of root fixing, which was adopted for the machinery of the British battleship "Superb." The blades are cut to length, an indent made for binding, and small tools are used for boring the hole by means of which the blades are strung together on wire with distance wedges. The latter are similarly cut to length and bored. In building up a segment or length of blading the wire is passed through the hole in one blade and secured. Distance wedge and blade are alternately strung and tightened up in the groove by means of a caulking tool ingeniously formed with a groove on the lower side to fit over the wire. The stringing completed, the blades are trued up in vertical lines. Then the binding wire is inserted, after which the lacing is put on around the binding wire and blade with silver solder heated by gas blow pipes; the segments being numbered according to their exact position in the turbine are assembled and caulked into the grooves, first with wooden mallets and later with special caulding tools.

THE NAVIGATION BRIDGE—THE BRASS INSTRUMENTS.

In the mechanical arrangements the non-ferrous metals appear mainly, of course, as glands, bearings,

fittings, etc., forming part generally in the auxiliary sections of the machinery. The low-pressure drums themselves were made of a special quality of steel, subjected while still liquid to hydraulic pressure of 12,000 tons. While the turbine glands are of cast iron they are fitted at the outer ends with Ramsbottom rings of "Ajax" bronze. The bearings for all the turbines are of cast iron lined with white metal on their running surfaces, and at the centre of each bearing there is fitted a safety strip of "Ajax" bronze 3-100 in. below the white metal. This was fitted in such a way that if the white metal by any chance gets heated and runs, the rotor will rest on the safety strip and the blades of the rotor will still be kept clear of the casing, while at the same time the casing blades will not rub against the rotor surface.

Gun metal is used also for the thrust blocks of the turbines. The parts known as the thrust rings are of gun metal, with white metal on the rubbing face. It may be mentioned that the top portion of the thrust block takes the steam thrust and the bottom portion of the propeller thrust. In connection with the line shafting which is 20 in. external diameter and 10 in. internal diameter, the plummer blocks have white metal on the bearing surfaces with arrangements for an internal water surface. The length of the propeller shafts are all 30 ft. 1⅝ in., and 22¼ in. in external diameter with a 10-in. diameter whole, and the propeller shaft liner is of gun metal in one piece, the diameter over the liner being 24¾ in. In the cast iron stern tube the forward and after bushes are of gun metal fitted with lignum vitæ strips.

It has already been mentioned that the blades of the propellers are of manganese bronze, but they are attached to the boss with high tensile steel studs and manganese bronze nuts. The use of high-quality steel is obviously on account not only of its strength, but also of its well-known ability to resist rust and the action of sea water generally, and the same reason doubtless accounts for the use of manganese bronze nuts. Gun metal is obviously a favorite constituent, as it appears again in the turning gear connected with each line of shafting, the worm wheel on the turbine shafting being of this metal. There is a complex apparatus for the supply of forced lubrication to the main bearings. Copper expansion pieces are utilized to connect the exhaust pipe from the high-pressure turbines with the main condenser. There are gun metal ends also for the steel plates of the condensers, and the valves through which the water is discharged from the condensers through the ship's skin are of gun metal. In the same plant the main pump casings and impellers are of this metal the casing being 9-16 in. thick and the diameter of the impellers is 42 in., while the pump spindle is of forged bronze carried in bearings external to the pump casings. A large amount of copper is used in the electric dynamos and motors in the various parts of the ship.

The electrical installation on board the "Mauretania" is a very large and complete one and is used not only for lighting, but for many power purposes. The refrigerating machinery, for example, is electrically driven and the armature of the two main motors for this purpose alone weigh over one ton apiece and contain a large amount of copper in the form of insulated strips or wire. As to the special suitability of non-ferrous metals in the engine fittings, the use of white bronze, gun metal or phosphor bronze (there are many various mixtures) is necessary for all bearings on account of the particular quality of these metals. The latest practice is for the very heavy main shafting such as propeller shafts, etc., to line the bearings with white bronze and this has been done in the case of the "Mauretania"; smaller bearings are usually lined with gun metal or phosphor bronze. These all form excellent wearing surfaces for the bearings which, if properly designed, can be relied upon to run perfectly cool and sweet under all working conditions.

The bearings of the "Mauretania" were made by Messrs. Dewrance & Co., of London, and are of the "Wheel" brand of white metal, which is one of the firm's registered alloys. It contains over 90 per cent. of tin and antimony and is the hardest and most durable white metal for lining bearings. One of its great merits is that it is not corroded by oil or grease, but keeps the bearings sweet and wholesome, and it has been used with the greatest success in the bearings of many of His Majesty's ships and the largest ocean liners.

Silver-plated metal has played an important part in the sanitary fittings, all of which in the first-class compartments are heavily silver-plated, and in this department also the useful white metal already referred to has been considerably utilized for gratings as well as for pipings and castings. These fittings, it may be mentioned, were made and fixed by Messrs. Doulton & Co., Ltd., of Lambeth, London.

Non-ferrous metals figure prominently in the feed water pumps and heaters furnished by Messrs. G. & J. Weir. The pump barrels, buckets, foot and head valve seats are all of gun metal, while the pump rods are of manganese bronze. The same gun metal is used for the air pump chambers in the dry air pumps. There are quite a number of these pumps whose efficiency is largely due to the extensive introduction of this metal. The feed water filters supplied by the Harris Patent Feed Water Filter, Ltd., which are 36 ins. in diameter, are wholly of gun metal. The distilling and evaporating machinery is mainly non-ferrous. All the evaporating shells are of rolled naval brass, double-riveted, while the ends of the evaporators and all the mountings as well as the frame and doors are of gun metal. The condensers have coils of solid drawn copper tinned inside and outside. A feature of the electrical deck cranes used for handling mail and baggage is that the wheel of the motor is fitted with phosphor bronze teeth.

PLATINUM MINES IN COLOMBIA.

In transmitting a series of reports showing the platinum deposits of Colombia and their history, United States Consul-General Jay White, of Bogota, writes as follows:

The following returns, showing the exports of platinum from Colombia in 1905, 1906 and 1907, were furnished by the courtesy of Dr. Viconte Parra R., director of the Bureau of Statistics, of Bogota, who says that discrepancy in value may be explained by the fact that shippers do not always give the market prices in the invoices.

Whither exported.	Quantity.			Value.		
	1905. Lbs.	1906. Lbs.	1907. Lbs.	1905.	1906.	1907.
United States	300.4	326.5	20.5	$26,810	$74,815	$2,856
Germany	8.8	....	...	800	......	.....
France	1,954.2	212.5	...	52,429	42,744	.....
United Kingdom .	211.7	26.8	...	3,049	4,660	.....
Total	2,475.1	565.8	20.5	$83,088	$122,219	$2,856

THE PATENT CONTROVERSY OVER BEARING METALS.

A NEW DEVELOPMENT IN THE SITUATION.

In the July number of THE METAL INDUSTRY* we published a letter from Andrew Allan, Jr., of A. Allan & Son, the manufacturers of Allan Metal, commenting upon a paper prepared by G. H. Clamer, secretary and metallurgist of the Ajax Metal Company, Philadelphia, Pa., on the subject of "The Patent Situation Respecting Alloys." Mr. Allan went over the ground and explained his reasons for his criticisms of Mr. Clamer's paper. He gives rather a history of copper-lead alloys than a dissertation on their manufacture and application. The following letter from Mr. Clamer in this connection will prove interesting:

To the Editor of THE METAL INDUSTRY:

Our attention has been directed to page 224 of your July number, in which appears an article by Andrew Allan, Jr., in discussion of paper which was prepared by the writer and read by Dr. F. T. Stevenson before the Foundrymen's Convention held in Cincinnati, Ohio, May 19, 1909.

Although the pages of the technical press are hardly a befitting place in which to discuss a grievance such as Mr. Allan apparently is laboring under, I feel that such statements as made by him should not go unchallenged and cause a general misapprehension of the situation which they undoubtedly would create.

In the first place, Mr. Allan criticises the title of my paper, i. e., "The Patent Situation in the United States Respecting Alloys," by the statement that my paper does not appear to be a discussion of the title chosen, but rather an epitome of our own personal situation. In reply allow me to say that legal situations are produced by the decisions of the courts, and as the decisions handed down by the courts in the plastic bronze case are the only decisions testing the validity of a patent covering an alloy which has been granted by United States Patent Office, this case has created the situation as it stands to-day. I regret, therefore, that in order to present my subject properly it was necessary to dwell so particularly on the plastic bronze case; but to come to Mr. Allan's real grievance, he seems desirous of proclaiming himself the real and true inventor of the class of alloys to which plastic bronze belongs. Before discussing this misapprehension of Mr. Allan's I wish to first present a concise statement of the differences between plastic bronze and Allan's metal:

1. Plastic bronze is a copper-lead-tin alloy in which tin exists in proportion of less than 9 per cent. in respect to copper, and the lead in greater amount than 20 per cent. of the entire alloy.	1. Allan's metal is an alloy of copper and lead without tin.
2. Plastic bronze is an alloy sufficiently strong for bearings in heavy service. Its strength is due to the presence of tin, and because it contains only 30 per cent. of lead, it is an alloy with the maximum amount of plasticity consistent with the proper amount of strength for most purposes.	2. Allan's metal is not sufficiently strong for uses such as car bearings and similar service. In fact, it is very much weaker than the common lead babbits, having very low compressive and tensile strength, and for this reason can only be used as a substitute for babbitt metals, i. e., for linings inside a stronger shell.
3. The structure of plastic bronze (copper, 65 per cent.; tin, 5 per cent.; lead, 30 per cent.) consists of a matrix of copper and tin, the proportion of the tin to the copper being such that a solid solution of the two metals is formed. This means that the matrix is absolutely homogeneous. The lead is supported in the matrix in a purely mechanical manner.	3. Allan's metal is a purely mechanical mixture of lead and copper, the copper forming the matrix, and as the alloy contains approximately 50 per cent. of lead, the walls of the matrix are comparatively thin.
4. In cooling from the liquid condition, the matrix of plastic bronze begins to solidify at 1940 degrees F., and is completely solidified at 1760 degrees. The lead is held in a liquid condition in the matrix until it has reached its solidifying temperature, i. e., 622 degrees.	4. In Allan's metal the copper solidifies at the solidifying point of copper, 1976 degrees, and envelops the lead, which remains liquid until it has reached its solidifying point, i. e., 622 degrees

*American Edition.

The above differences in composition between Allan's metal and plastic bronze, i. e., Allan's metal consisting of copper and lead only, whereas plastic bronze consists of copper and lead with tin in a substitutional amount, puts these alloys in an entirely different class so far as uses are concerned, Allan's metal being a lining metal and a substitute for babbitt metal, whereas plastic bronze partakes more of the nature of a bronze than babbitt, its strength comparing favorably with bronze and its plasticity with babbitt. No claims whatever have been at any time made by us to a copper and lead alloy without a hardening constituent, as we have long been perfectly familiar with the fact that lead and copper when melted together and poured into castings can be held in fairly uniform mixture in a casting, even of considerable size. Such castings have been frequently made by ourselves and others. Whether Mr. Allan was the first to make such an alloy or not I do not know. Probably he was, and I wish to say that the alloy of lead and copper is very admirably suited for certain purposes, such as lining bearings, which are apt to be affected by heat, for facing pistons of steam engines, for piston rod packings, etc.

For the above-mentioned purposes this alloy meets the requirements not filled by other alloys, and if he was the first to introduce such an alloy, for this he deserves credit; but now apparently he is led to the misapprehension that because he has made such a copper and lead alloy he has also invented the copper-tin-lead alloy within the scope of our plastic bronze patent. The difficulty which we overcame was not alloying lead and copper alone, but alloying lead and copper in the presence of tin. Tin when present in too great an amount in proportion to the copper will segregate the lead if present in amount somewhat exceeding 20 per cent. When lead in such an alloy is much above 30 per cent. the alloy rapidly loses strength. We discovered the relative proportions in which tin and copper should exist in order to form a matrix of proper strength, and physical properties to maintain the lead in correct proportion in a mechanical admixture to give an alloy of sufficient strength to be used for solid bearings.

The two analyses of Allan's metal which we have made gave the following results:

ANALYSIS NO. 1.

Copper	51.35
Lead	48.26
Sulphur	Not determined
Bismuth	" "

ANALYSIS NO. 2.

Copper	54.00
Lead	46.09

Sulphur	.23
Bismuth	.10

The bismuth shown by this analysis might possibly be an impurity, but the sulphur is in greater amount than would be contained in the most impure copper or lead. In all probability it forms a part of Mr. Allan's "secret process." I strongly doubt, however, if any beneficial effect is to be derived from its use; at least I can positively say that lead can be held in a mechanical mixture with copper just as well without it.

Photo-micrograph No. 1 shows such an alloy without sulphur. This is a photo-micrograph of a specimen which has been polished only (not etched). Photo-micrograph No. 2 is the same alloy with sulphur. The photographs show very plainly the mechanical admixture of the lead. These photo-micrographs, therefore, refute Mr. Allan's statement that his metal is perfectly homogeneous and actually like one metal. They further refute the statement that the melting point is 1,500 degrees. The copper constituent will melt at the melting point of copper and the lead constituent at the melting point of lead.* and should the alloy be heated to a temperature equivalent to the melting point of the lead the strength is maintained only by the still solid copper which suspends it. The addition of lead to the copper does not lower the melting point of the copper constituent from the melting point of copper, which is 1,976 degrees to 1,500 degrees F., as there is no union between the metals, and but slight solution of one in the other.

Coming now to the main point of contention, i. e., whether or not Mr. Allan previous to 1900 manufactured an alloy containing over 20 per cent. of lead, balance being tin and copper, in which the tin was in proportion of less than 9 per cent. to copper, Mr. Allan makes the following statement: "The claim may arise that A. Allan, Sr., is not or has not been manufacturing a copper, tin and lead alloy. True, most of his formulæ do not contain tin. This does not affect the case if the patent in question is legal." Now if Allan's metal does not contain tin it is not an infringement on this patent, nor does it anticipate it. If, however, he manufactures at the present time an alloy containing tin as above he is infringing on this patent, and were the case brought to litigation it would be incumbent upon him to prove beyond a reasonable doubt to the satisfaction of the Court that he had made in other than an experimental way such an alloy previous to 1900 in order to anticipate it. It hardly seems possible that he should have done this, as a perusal of his Bulletin No. 1 of June, 1908, definitely states that he did not. The following is an extract from his bulletin:

Allan, however, had learned from experience that tin, nickel or other metals added to the lead and copper mixtures, were injurious to the anti-frictional qualities of the lead, and without raising the melting point, rendered the mixtures hard and brittle. Tin, especially, because of its adhesive qualities, he found to be a very undesirable element in a bearing metal. A Babbitt containing tin, will, when heated, stick to, hug and tear the shaft. His aim was, therefore, to eliminate the admixture of other metals to the lead and copper alloys, and he succeeded as early as 1876 in discovering a process by which lead and copper can be alloyed in any desired proportion, and a perfectly homogeneous mixture obtained.

For different classes of service compositions are made according to the different formulæ, but lead and copper only constitute these compounds, and they contain no tin at all. Their color when cut or turned, is white as other Babbitt; when in service, the bearing changes to a highly polished copper color. The copper, as it were, comes to the surface with its great tenacity, preventing wear, and thoroughly mixed with the lead so as to form actually one metal, this composition forms the most perfect bearing metal known.

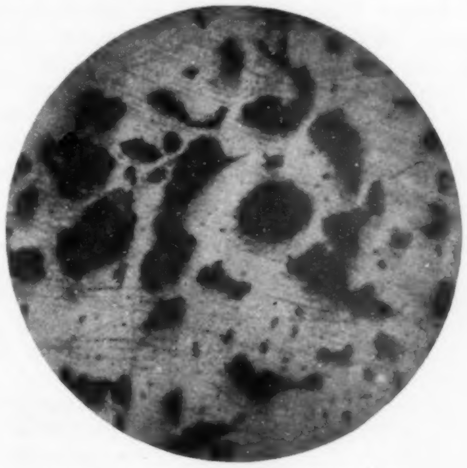


FIG. 1. MAGNIFIED 100 DIAMETERS.

FIG. 2. MAGNIFIED 100 DIAMETERS.

It is curious to note that after decrying the use of tin in a bearing metal because of its adhesive qualities, he makes the following statement in pronouncing the virtues of his metal:

"Being plastic and malleable, these lead and copper alloys possess all the virtues of genuine Babbitt as anti-frictional metal, and we have consequently classed then under the general denomination of Babbitt metal."

Genuine babbitt, as we all know, is a metal containing 90 per cent. of tin.

From a legal standpoint, we wish to say that our plastic bronze has nothing whatever to do with copper and lead alloys. This has always been definitely disclaimed by us, as will be shown by cross-examination of Dr. Charles Chandler, of Columbia University, one of the experts for the complainant in a recent suit for infringement of our plastic bronze patent, which is as follows:

XQ-7—"I understand from your answer to Q-4 that it was common to use combinations of lead and copper for bearing metal prior to patent in suit. Is that correct?

A—I can't say how common it was, but I am aware that the combinations of copper and lead have been used."

Further testimony was taken in the case bearing on copper and lead alloy from another party (Hewitt). In this case there was even the rambling statement made in the patent specification covering the alloy that tin might be added from 1 to 10 per cent. The patent in

*Effected only by the slight solubility of the metals in each other.

question was in the Patent Office at the same time as our plastic bronze patent, but was filed about one month in advance. The Patent Office evidently did not consider these two applications to cover the same patent, as they were never brought into interference. After discussing several other patents which were cited as anticipations, the Circuit Court made the following statement:

"All this is too wide of the mark to require discussion. So also is the Hewitt (1901) beside which it is later in date than patent in suit, from which time alone it takes effect as a publication. Bates vs. Coe, 98 U. S. 31. Diamond Drill Co. vs. Kelly, 120 Fed. 282. And even assuming that the date of the publication, which is earlier, could be considered, it amounts to no more than other patents referred to, if so much, it being doubtful if it states anything practical."

In the Hewitt patent it was clearly shown by the statement that tin could be added up to 10 per cent. together with lead in the neighborhood of 40 per cent., that the patentee did not understand the philosophy of making a copper-tin-lead bearing. The Hewitt anticipation was not commented on at all by the Court of Appeals.

Therefore, the point which I wish to make is that we do not consider Allan's metal an infringement or anticipation, providing same is held strictly to copper and lead composition. As to the relative merits of the two metals, the truth of the matter is that millions of pounds of plastic bronze are in use at the present time in services in which Allan's metal would be entirely unsuited, and I dare say also that there are large quantities of Allan's metal in use in services where plastic bronze would be entirely inefficient. They both have their fields of usefulness. G. H. CLAMER.

Philadelphia, July 24, 1909.

SPOTTING OUT OF PLATED ARTICLES, ITS CAUSE AND CURE.*

REMEDIES SUGGESTED BY SEVERAL EXPERTS.

BY JOHN J. FANNON.

No doubt all platers have more or less trouble with the spotting out of their work after being finished, more especially perhaps in warm weather. In my experience I have tried most every known remedy to cure this trouble and have met with very little success. The method which has, however, proved to be the most successful is by taking advantage of the expansive and contractive qualities of metal under the influence of sudden heat and cold.

In the operation of polishing, buffing and plating metallic articles there is always more or less of foreign substances which get into the pores of the metal, and these impurities are no doubt the cause of the spotting out of the work after it is finished. While this is really no fault of the plater but rather his misfortune, at the same time it is usually up to him to stop it.

THE METHOD.

After the work has been finished whatever may be the color, either gold, silver, bronze, etc., if the articles are plunged into boiling hot water for about one minute, the cast metal will heat up very rapidly and will hold this heat, now if it is quickly transferred to clear cold running water the sudden change from hot to cold will cause the pores of the metal, which expanded by action of the hot water, to contract very suddenly. By this contraction whatever traces of chemical salts, etc., that have been absorbed and held in the pores will be forced out.

The articles are then placed again in the hot water and by the re-expansion of the pores the clean water is absorbed. After four or five repetitions of this process, i. e., from hot to cold and cold to hot, the last traces of the absorbed matter will be eliminated. Any water which may finally be held in the pores will, providing the water is clean, dry out naturally and leave no opportunity for spotting out. The entire process should take no more than five minutes governed, of course, by size and class of material handled.

BY H. C. BERNARD.

The spotting out of plated articles is perhaps one of the greatest annoyances that most platers have to contend with. This evil, which is more prevalent in the summer months when the atmosphere is heavily charged with moisture, is due to the various salts used in electro-plating. They are seemingly absorbed by the pores of the metal and after a while are forced to the surface where a chemical action takes place by the salts combining with the oxygen of the air and causing an unsightly appearance not unlike flyspecks.

Having had several years' experience in plating all kinds of metal,especially cast iron, which I believe is the most susceptible to spotting out. The porous condition of this metal; being due to the contraction while cooling after being poured, is much greater than metals that have the pores closed or partially closed in the process of rolling.

The method which I have used with most success, is to immerse the article, after being plated and rinsed in clear water, in a solution of commercial cream of tartar—commonly known as red argols. Two ounces of the cream of tartar being used to each gallon of water.

Allow the articles to remain in a boiling solution for one-half hour, when most of the salts will be removed. After this place the articles in an oven heated to 160 degs. F. for several days when the final process of elimination of the salts will take place. Take the articles from the oven and remove the tarnish which will have formed, by dipping them into a pickle composed of four ounces of muriatic acid to each gallon of water. Rinse in clear water and scratch brush in a soapbark solution, then finish in the regular way.

*Papers read at July 16 meeting National Electroplaters' Association.

BEAUTIFUL LUSTRE COLORS ON BRASS.

One ounce of cream of tartar is dissolved in 1 quart of water, to which is added half an ounce of tin salt (protochloride of tin) dissolved in 4 ounces of cold water. The whole is then heated to boiling, the clear solution decanted from a trifling precipitate and poured with continual stirring into a solution of 3 ounces bisulphite of soda in one-half pint of water, whereupon it is again heated to boiling and filtered from the separated sulphur. The colors at first will be a light to dark gold-yellow, passing through all the tints of red to an irridescent brown. As oxidizing brass is one of the hardest features in the plating industry, much depends on the chemicals and careful mixing of this dip; also, have brass absolutely clean. H. A. OSWALD.

THE DEVELOPMENT OF MELTING FURNACES.

A Description of the Earliest and Latest Types.

By L. J. Krom.

In December, 1903, The Metal Industry* published a short resumé of the various types of furnaces for the melting of brass and similar alloys. Since that time progress in furnace development has been rapid, and many new types have been produced; while some of the older furnaces have been greatly improved and others have become entirely obsolete.

Among furnace users, the matter of superiority of any particular method of melting or style of furnace best adapted is still largely a question of special conditions and personal experience. The principal points to be considered when making a selection of a furnace are: First, cost of fuel and operation, and, second, melting efficiency and loss of metal. The cost of installation, while a factor, need not be given any special consideration other than that due to good business judgment, for the furnace that answers satisfactorily all local conditions is the one to use and is cheap at any price.

IDEAL BRASS MELTING.

The ideal method for mixing brass and kindred alloys would be one where none of the products of combustion of the fuel came in contact with either metal or container; where no question of forced or natural draft had to be settled; where there were no ashes or residues to be handled; where the source of heat would be uniform and easily regulated; where there was no oxidizing action, thereby confining melting loss to a mechanical one, and where the time consumed in melting was reduced to a minimum.

THE ELECTRIC FURNACE.

Of course there is only one type of furnace that could possibly answer the above conditions, and that is the electric furnace. This furnace has not yet come into general use, owing principally to its high cost, both of installation and operation, but in localities where cheap water power is available it undoubtedly is the furnace "par excellence."

The furnace shown in cut (Fig. 1) is known as a simple induction furnace and consists of an annular hearth lined with magnesite, through the centre of which passes one leg of a transformer round which the primary coil is placed. The coil is connected to the terminals of an alternating single phase generator, and the alternating current passing through the primary coil forms an induced current in the ring of metal contained in the hearth. This ring forming a single circuit round the core and primary coil, the current induced in it is approximately equal to the primary current multiplied by the number of turns in the winding of the coil, the voltage diminishing in about the same proportion as the increase of current. This furnace is now being made in this country by the American Electric Furnace Company, 45 Wall street, New York, and is the invention of Dr. Kjellin, of Sweden, and E. A. Colby, of America.

Some of the results attained by this furnace in melting brass, etc., are as follows:

Figuring the cost of electricity at .5 cent per kilowatt hour, brass can be produced at a cost of 50 cents per ton, but at present writing it is very doubtful if these figures can be justified at any locality where cheap and abundant water power is not available. We show a cut (Fig. 2) of a 60 k. w. induction furnace in action, and the ideal conditions existing can be realized when it is stated that the entire charge was melted and poured in 20 minutes, with a maximum current of 15 k. w. hours The quality of brass made was unexcelled and of homogeneous texture. The American Electric Furnace Company are now in negotiation with several large brass mills in the Naugatuck Valley, Connecticut, with a view of installing this furnace for the production of wrought brass in large quantities. This will be quite an innovation in this section, as it has been the universal practice to melt and mix brass in small units of weight, 250 lbs. per crucible being considered a large charge to melt of yellow brass at one time. This applies to wrought brass only, poured in iron molds to make sheet, rod and wire.

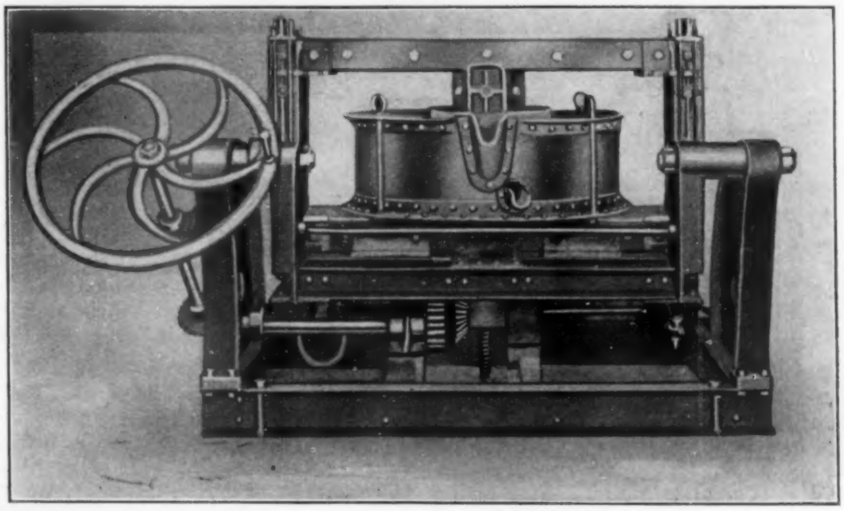


FIG. 1. SIMPLE INDUCTION FURNACE.

Of course in the operation of an electric furnace we are not particularly concerned with the products of combustion. We get our heat producing energy in a highly concentrated form as electricity and realize probably the highest efficiency from our fuel. It is when we are applying our fuel direct that we should and do look to combustion conditions.

Of the materials available for fuel to be used in either direct contact with the metal itself or with the crucible containing it we have coal, coke, oil and gas. The question which of these is the most economical and ad-

*American Edition.

vantageous to use is again one of local conditions. As far as the production of heat goes the process of combustion is identical; the carbon of the fuel must first be oxidized and consumed in order for the heat units to be utilized.

ELEMENTS ESSENTIAL TO COMBUSTION.

The elements that are essential to combustion are carbon, hydrogen and oxygen, the carbon being furnished by the fuel and the other elements by the atmosphere and water vapor.

In this connection the recent catalogue of the W. N. Best American Calorific Company, New York, has such an excellent dissertation on combustion that we quote freely from it.

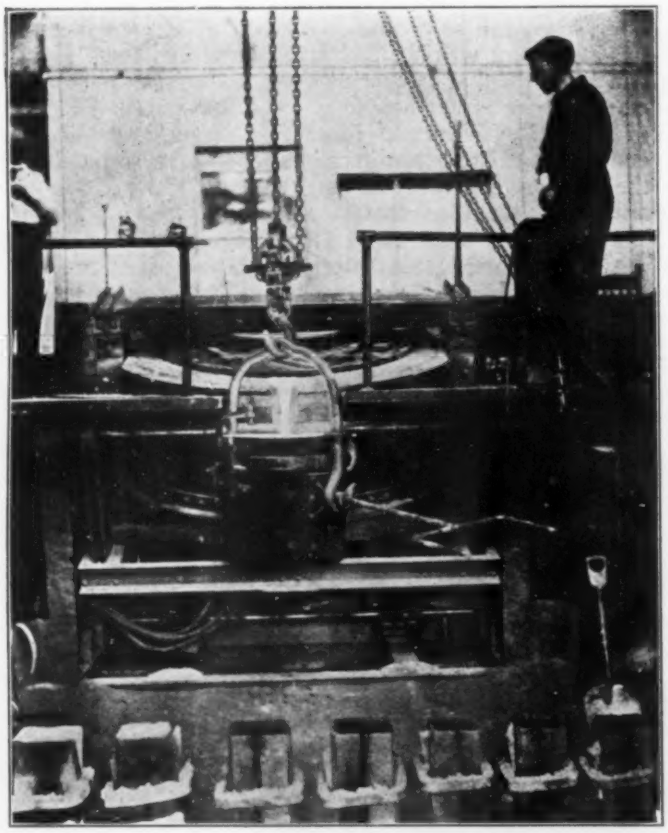


FIG. 2. 60 K.W. INDUCTION FURNACE IN ACTION.

As is well known combustion is a chemical combination which is attended by the evolution of light and heat. When carbon in an incandescent condition is brought in contact with oxygen, a combination results in the formation of carbon dioxide provided there is a sufficient supply of oxygen or air present; the reaction being one atom of carbon, or C, combining with two of oxygen, or O_2, as $C + 2O = CO_2$, which gives us carbon dioxide, or the product of complete combustion of the carbon. If a greater quantity of air is furnished, the same chemical law is followed and the carbon cannot be made to unite in a greater proportion than one of carbon to two of oxygen.

Should the air supply be insufficient, however, we find the carbon dioxide already formed giving up one of its atoms of oxygen to form carbon monoxide, or CO, which is the result of imperfect combustion. This gas has a pale blue flame and burns with excess of oxygen to form carbon dioxide, as $CO + O = CO_2$.

HYDROGEN.

Another element having great economic value is hydrogen, and its combustion is effected by two atoms of hydrogen uniting with one atom of oxygen to form water; the relative atomic weight of water (H_2O) being 2 parts hydrogen and 16 parts oxygen, or in the ratio of 1 to 8.

NITROGEN.

Nitrogen is an inert gas and does not contribute to combustion, but as a dilutent retards the violence of chemical combination. It is also to be reckoned with as an absorbent of the energy resulting from combustion.

HEAT OF COMBUSTION.

The chemical combination of a combustible with oxygen disengages energy in the form of heat.

The quantity or measure of this heat may be expressed in British thermal units (B.t.u.), or the quantity of heat required to raise the temperature of one pound of water one degree Fahrenheit. The temperature of a flame does not depend on its luminosity. A hydrogen flame, which is the palest of all flames, gives the greatest heat.

Of all combustibles carbon is the most widely distributed and available. Carbon is the principal constituent of coal and petroleum. Combustion, as here considered, is universally supported by oxygen, which never exists in nature except in association with some other substance. In atmospheric air it is associated with inert gas, nitrogen, in the relative proportion, by volume, of

Oxygen	0.213 parts.
Nitrogen	0.787 parts.

The number of British thermal units released by the combustion of one pound of the following substances, and the resultant temperatures are:

Hydrogen burned to	H_2O,	62,032	B.t.u. Temp.	5,898°F.
Carbon "	" CO_2,	14,500	" "	4,939°F.
Carbon "	" CO,	4,452	" "	2,358°F.

The great loss of heat due to the incomplete combustion of carbon is shown by the difference between the total heat of perfect combustion of carbon to CO_2 (14,500 B.t.u., and that of carbon to CO (4,452 B.t.u.). One pound of carbon when imperfectly burned produces

$$\frac{12 + 16}{12} = 2\tfrac{1}{3} \text{ pounds of carbon monoxide.}$$

If this quantity of gas is burned to carbon dioxide, the total amount of heat released will be 14,500 — 4,452 = 10,048 B.t.u., therefore, the caloric value of one pound of carbon monoxide is $\frac{10,048}{2\frac{1}{3}} = 4,312$ B.t.u.

A typical analysis of petroleum is as follows:

Carbon	.84
Hydrogen	.14
Oxygen	.02
	1.00

Allowing for the oxygen to unite with its equivalent of hydrogen to form water, the calorific value would be based upon the corrected quantities as follows:

Carbon....	.84	× 14,500 =	12,180
Hydrogen.	.1375	× 62,032 =	8,529
Water ...	.0025		
	1.0000		20,709 B.t.u = the

calorific value of one pound of oil when its carbon is burned to CO_2.

If, however, combustion is imperfect and the carbon be burned to CO, then the total heat would be:

$$.84 \times 4{,}452 = 3{,}739$$
$$.1375 \times 62{,}032 = 8{,}529$$

12,268 B.t.u., or about 59 per cent. of that obtained in the first instance. In fuel oils, having a less percentage of hydrogen, the proportionate loss would be greater.

From the foregoing considerations it will be apparent that to obtain economy in the use of oil as fuel, combustion must be complete. Carbon should be burned to CO_2, and this should be accomplished inside of the furnace if the resultant heat is to be utilized. The absence of smoke does not indicate perfect combustion, and there should be absence of luminous flame in the escaping gases. It is also apparent that if more air be introduced into the furnace than is required to supply the oxygen needed for combustion it will be detrimental by absorbing heat and reducing furnace efficiency. Furthermore, in heating brass, etc., free oxygen in contact with the hot metal will unite with it to form oxide of zinc and copper.

To burn oil in a furnace it is necessary to atomize it and unite it with atmospheric oxygen at the temperature of ignition. It is evident that space should be provided for the expansion of the gases and provision made for their thorough mixture and distribution in a combustion chamber. Unconsumed fuel should not be brought in contact with cold metal, because its temperature will be lowered below the point of ignition.

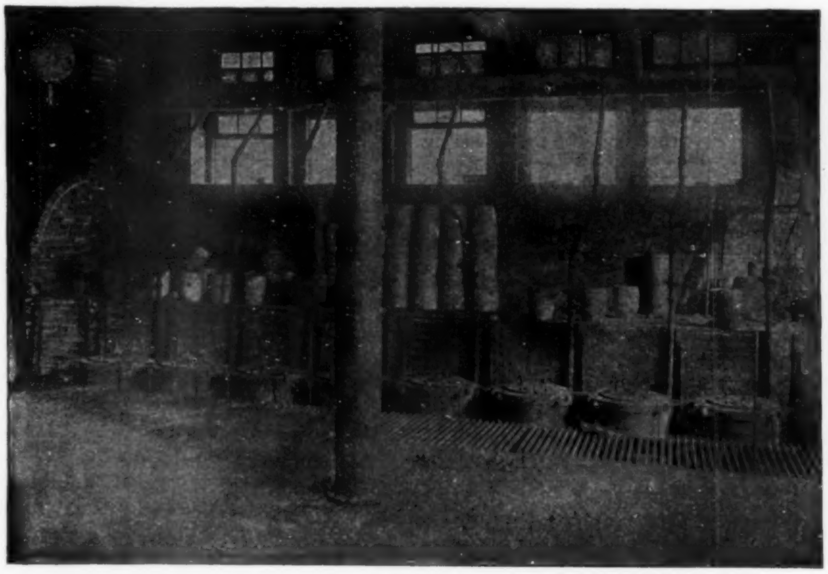


FIG. 3. BATTERY OF PIT FURNACES AT WESTERN ELECTRIC COMPANY, CHICAGO, ILLINOIS.

BAD PRACTICE.

It is common practice to build a furnace of size and shape required for the material to be heated. No combustion chamber is provided. The oil is sprayed by a low pressure blast of air into the chamber in which the material is charged. Each globule of oil expands to a mass of vapor having a volume many hundred times greater. In order to burn this vapor it must take up the requisite oxygen, and it is evident the greater the volume of these separate masses the longer will be the time required for the combustion to take place.

The sudden expansion of these globules into vapor produces a pressure which, assisted by the air blast, quickly expels the gas from the furnace. Some of the smaller vapor masses will receive their quota of oxygen to form CO_2, then mingle with greater volumes of vapor and be reduced to CO. The greater portion of the gas escapes from the furnace as carbon monoxide (CO) to meet the oxygen of the outer atmosphere, and is burned to dioxide outside of the furnace. The flame is positive evidence of this. In such practice the greatest heat development is outside of the furnace.

PIT CRUCIBLE FURNACES RUN WITH COAL-COKE GAS OR OIL.

These furnaces can be divided into three classes—those which use coal or coke with natural or forced draft, those with oil blown in with air or steam and, finally, those fired with gas mixed with air or steam. The general construction is the same except in case of the oil and gas fired furnaces, which do not have a grate. A pit furnace consists of either a square or round opening laid up with fire brick, or a square or circular sheet iron form lined up in the same manner, the latter being the most popular form, although both forms are in general use in the brass centers of the country, notably in Connecticut.

All three classes of furnaces require a draft stack or chimney ranging in height from a few feet for the forced draft to upwards of 160 feet for natural draft furnaces. The question of draft is a vital one, and at the present time it has not been definitely settled as to the best practice in general to be followed. Local conditions govern largely the size of chimney and height, but the fact that there is over $1,500 worth of zinc being lost in the atmosphere daily, owing to oxidation in the manufacture of brass, proves that there is still room for improvement in this direction.

FLUES AND STACKS.

The construction of flues and stack or chimney has undergone some very radical changes in the past few years. It is only a short time ago when all that was considered necessary was to run a straight channel from the back of the furnace to the stack, which might be of either brick or iron. Now the most approved practice directs that a considerable space be left back of the furnaces and also in the bottom of the chimney. The spaces act as receptacles to retard the progress of and to hold the heavier particles of zinc oxide which may be carried through the flue together with fine shot of metal sprayed out of the crucible. To the writer's knowledge one concern succeeded in recovering 80,000 pounds of salable zinc oxide by means of this construction; the intensity of the draft being regulated by means of counterpoised dampers. The stacks in this particular mill are 160 feet high, and each stack furnishes adequate draft for 80 pit furnaces.

We show some of the more modern forms of pit furnaces ranged in groups or series. Cut No. 3 shows an installation at the works of the Western Electric Company, Chicago, Ill., by the Whiting Foundry Equipment Company, of Harvey, Ill. These furnaces are run with coal or coke, and are designed for use with natural or forced draft, the base being fitted with a removable ash-pit door. The furnace itself consists of a steel shell that is lined up with firebrick in circular form.

(To be continued.)

THE CHEMIST'S RELATION TO THE COPPER AND BRASS INDUSTRIES.*

By Ernest A. Lewis.

It has recently been suggested in America that standard methods of analysis should be adopted by the copper and brass trade; there is much to be said in favor of such a proposal, but there is no one method which will suit every alloy. Two or three methods are wanted which have been proved to give accurate results, and the exact condition of working must be known, and it is with a view to help to get standard conditions in the copper and brass industry that this paper has been written.

DETERMINING THE MOISTURE.

Copper Precipitate.—Two lots of 200 grms. each are dried for 4 hours in a steam oven, and reweighed after a further 1 hour's drying to ensure the weight being constant. The use of a higher temperature leads to inaccurate results; this material usually contains straw, fibres, and similar organic matter, and to attempt to remove this will lead to oxidation of the copper.

Rich Copper Scale.—Many sellers insist upon this material being dried in a steam oven, so that only moisture is driven off, whilst the smelters dry it over a flame to drive off oily matter. The determination of moisture is made by heating two lots of 200 grms. each of the scale in porcelain dishes over a small rose flame until the water is driven off, then the heat is increased until the oil comes off; the scale must be stirred continuously, and immediately vapors cease coming off the heating must be stopped.

Shop Sweeps and Similar Residues.—Two lots of 500 or 1,000 grms. each are dried in an iron pan over a flame until all vapors are driven off and all organic matter decomposed. The samples for analysis must be taken from the dried material.

METHODS OF COPPER ASSAY.

Two methods of assaying copper can be relied upon to give accurate results; they are the electrolytic method and the iodide assay. To determine copper it must be separated from the gangue and matter mixed with it.

The sample of residue, as received by the chemist for assay, usually has a sample of metallics in the packet. Some chemists crush the fines to go through a 90 sieve, weigh out 1 or 2 grms. of the proportion of fines and metallics, decompose with nitric acid, filter off the silica and electrolyze. This method is doubtless satisfactory for some products, such as copper scale, but for others it is unsuitable. The method I adopt for all these residuals, such as ashes, sweeps, concentrates, precipitates, etc., is to assay the metallics separately, using about 0.4 grm., and estimate the copper by the iodide method. The fine material, which should have been crushed to go through a 30 sieve before it reaches the laboratory, is crushed to go through a 60 sieve; there is no need to use a finer sieve; if there any metallics which will not go through a 60 sieve they must be cut up as fine as possible—there is no need to separate them and assay separately. The fines are thoroughly mixed and 10 grms. evaporated to dryness in a 500 c.c.-Jena flask with 20 c.c. of nitric acid and 50 c.c. of hydrochloric acid. When cool, the residue is moistened with 30 c.c. of hydrochloric acid, boiled until all nitrous fumes are driven off, diluted with about 100 c.c. of hot water, and boiled for 10 minutes; if any of the material sticks to the flask it must be loosened with a glass rod. The solution is then filtered into a 500 c.c. Jena lipped beaker, at the bottom of which are 2 pieces of thin zinc stick, weighing about 20 grms. After washing, the beaker is put on the hot plate for 15 minutes until the copper is all deposited. The spongy copper is filtered off, well washed with hot water, and washed into the beaker, while the pieces of zinc are transferred to a test tube. 10 to 20 c.c of nitric acid (according to the amount of copper) are poured on the zinc, and as soon as the effervescence commences the acid is poured into the beaker and the zinc washed with about 10 c.c. of cold water, and a further 10 to 20 c.c. of nitric acid is poured into the beaker. The cleaning of the zinc must be carried out quickly and the zinc must be instantly washed with water. Every trace of copper is removed from the zinc. The copper is dissolved by boiling on the hot plate for at least 10 minutes. The solution is cooled and diluted to 500 c.c., and, according to its richness in copper, 25, 50, or 100 c.c. are taken for the iodide assay, and 50 or 100 c.c. for the electrolytic assay. The percentage of metallics and fines being known, a simple calculation will give the percentage of copper in the residue.

To estimate the copper in a pure copper scale, 10 grms. of the powdered material are dissolved in 40 c.c. of nitric acid and 40 c.c. of water, boiled to expel acid fumes, diluted, and filtered into a 500 c.c. measuring flask; 50 c.c. are electrolyzed after adding 10 c.c. of sulphuric acid and diluting to about 250 c.c.

ANALYSIS OF BRASS BORINGS.

The accurate estimation of copper in samples of brass borings is not easy. Brass borings are often bought in large quantities without analysis. I have recently come across cases of adulteration with sand; in one case nearly 20 per cent. being present, which could not be seen by casual inspection. Borings often contain from 1 per cent. to 3 per cent. of oil. If the sample contains any large pieces they must be cut up to get the whole sample of an average size. Then 10 grms. are heated in a large porcelain crucible, over a small rose flame, to drive off oil; immediately the evolution of fumes ceases the crucible is allowed to cool and weighed. The borings are transferred to a 500 c.c. lipped beaker, with 40 c.c. of nitric acid and 40 c.c. of water, and when the metal is dissolved the excess of acid is boiled off. Any sand or tin can easily be seen on diluting. Brass borings do not as a rule contain tin except in very small quantity. If tin and sand are present, they are best weighed together after ignition, the tin is reduced in hydrogen, dissolved in hydrochloric acid, precipitated with pure zinc, digested in nitric acid, and weighed as oxide. The sand is determined by difference. The filtrate from the tin and sand is received into a 500 c.c. measuring flask; 250 c.c. are evaporated with 20 c.c. of sulphuric acid to separate the lead, and iron precipitated by means of ammonia, as usual, and weighed as ferric oxide. The copper is determined in 50 c.c. of the original solution by electrolysis or in 25 c.c by the iodide assay. For technical purposes the zinc is taken by difference. Manganese bronze borings, after separating the tin and sand (if present), are analyzed as described for manganese bronze below. When it is desired to find the percentage of free iron in borings, 20 grms. are washed with ether to extract oil, and the free iron picked with a magnet and weighed.

GUN METAL BORINGS.

Ten grms. are heated to remove oil, and digested with 60 c.c. of nitric acid and 60 c.c. of water, the solution is filtered, and any tin and sand is ignited and weighed. The precipitate is macerated in a small mortar, a portion

*From a paper read at Birmingham meeting of the Society of Chemical Industry.

weighed into a boat and reduced in hydrogen; the tin is separated by means of pure zinc, and oxidized with nitric acid. The stannic oxide obtained is sufficiently pure for a technical assay. The filtrate from the nitric acid may contain a little copper and lead, and is added to the main portion and diluted to 500 c.c., as described under brass. The zinc used for precipitating the tin must, of course, not be dissolved.

Samples of copper borings cannot always be accurately sampled by taking a small portion; the only way to analyze such samples is to weigh out 50 grms., dissolve it in nitric acid, dilute it, and use one-fifth part for the analysis.

THE ELECTROLYTIC DETERMINATION OF COPPER.

As much of the alloy as contains about 0.8 grm. copper is dissolved in 4 c.c. of nitric acid and 4 c.c. of water (in the case of gun metal, 5 c.c. of each of acid and water); the solution is heated on the hot plate, without boiling, until greasy streaks run down the side of the beaker, diluted with water (any tin present being now filtered off), 2 c.c. of sulphuric acid added, and diluted to about 250 c.c., any lead being allowed to settle. The solution is now electrolyzed in the usual way. I have never found any difficulty in precipitating 0.8 grm. of copper in 18 hours, using 4 Daniell cells. If the current can be obtained through a resistance from a lamp, 1-5 grms. can easily be separated in 12 hours, but in this case 12 c.c. of sulphuric acid must be added.

IODIDE METHOD.

The only other reliable method of copper assay is the iodide method. It has been stated that the thiosulphate solution must be standardized every day, as it does not keep, but this is not so. I have repeatedly tested solutions after keeping them six weeks and using them every day, and there has not been the slightest alteration in strength. Certain precautions must be taken—the solution must be kept in a bottle with a well fitting stopper, in a dark, cool cupboard, free from acid fumes. The burette, containing the solution, when not in use, must be kept full and corked with a sound cork. Another objection urged against the method is that the blue color returns after a time; but with careful working, there is no danger of this. The solution must be free from nitrites and not too dilute. For all commercial work I use a solution (1 c.c. = 0.01 grm. of copper) made by dissolving 40 grms. of "Hypo" crystals in 1,000 c.c. of distilled water and filtering the solution; this is standardized against pure copper, the copper contents of which have been accurately determined electrolytically. Three lots of about 0.4 grm. each are dissolved by warming in 500 c.c. flasks, with 4 c.c. of nitric acid and 4 c.c. of water, and the solutions heated on the hot plate until the neck and sides of the flasks appear greasy, and diluted to about 70 c.c.; sodium carbonate solution is added till a decided precipitate forms, when 4 c.c. of 50 per cent. acetic acid is added, the neck of the flask washed, and the solution diluted to about 150 c.c.; the solution is now well shaken with 3 grms. of potassium iodide and allowed to stand for one minute, and then titrated with the thiosulphate solution, 1 or 2 c.c. being run in at a time, and 4 c.c. of starch solution being added when within 3 or 4 c.c. of the end. An assay of brass, accurate within 0.2 per cent., can be obtained in half an hour by the iodide method; the results are as accurate as the electrolytic methods.

ANALYSIS OF COMMERCIAL COPPERS.

It is not possible to use one standard method for all coppers. Separate quantities must be weighed out for nearly every estimation.

COPPER AND LEAD.

The best method to estimate these two metals in electrolytic copper is to dissolve about 2 grms. in 8 c.c. of nitric acid and 8 c.c. of water, as described above, then add 10 c.c. of sulphuric acid, and electrolyze. The lead may be weighed on the spiral as peroxide, but it will probably only be present in traces. When the electrolysis is completed the cone and spiral are rapidly transferred to a beaker of clean water and washed in the usual way. There is no danger of either copper or lead redissolving if this is done quickly; the elaborate washing and syphoning described in some text books is unnecessary. The lead oxide must be washed in distilled water only, not in alcohol.

The analysis of a tough copper or Chili bar is carried out as above, using 1 grm., or 2 grms., if the highest degree of accuracy is required. In the case of a copper containing over 0.2 per cent. of lead the latter should be separately estimated in 1 or 2 grms. in a solution containing only nitric acid, the copper being estimated in a separate lot. Copper cannot be correctly determined in a solution containing only nitric acid, especially if the copper contain arsenic. In the presence of 10 c.c. of sulphuric acid and sufficient nitric acid, arsenic and antimony are never deposited with the copper.

BISMUTH.

Bismuth must be accurately determined to 0.001 per cent. This can only be done by the colorimetric method. The modification I use is as follows: 10 grms. of the copper are dissolved in 35 c.c. of nitric acid and 35 c.c. water, excess of acid boiled off, and ammonia added until the solution is neutral. Ammonium carbonate solution is then added in excess and the solution kept nearly boiling for 6 hours, when the precipitate is filtered, washed, and dissolved in 4 c.c. of dilute sulphuric acid, and the solution diluted with water to about 150 c.c. 5 grms. of potassium iodide and 5 c.c. of dilute sulphurous acid (1 part of the saturated solution and 10 parts water), are now added, and the solution is boiled, and the cuprous iodide filtered off. If the solution is yellow, 2 or 3 c.c. dilute sulphurous acid solution are added; if the color is permanent, bismuth is present. The solution may be diluted to 500 c.c. and 100 c.c. compared colorimetrically in a Nessler glass, against the color formed by adding a standard solution of bismuth to a solution of potassium iodide containing a little sulphurous acid. No gravimetric method of estimating bismuth in copper is of any value.

ARSENIC.

Various methods of estimating arsenic in copper have been described, the most generally used being the various destillation methods. I have not found it necessary to add calcium chloride to the ferric chloride mixture to get the whole of the arsenic over, provided fuming hydrochloric acid is used and the distillation carried out slowly. For this estimation, from 2 to 5 grms. of the copper are slowly boiled for ½ hour with 20 grms. of ferric oxide dissolved in 200 c.c. of fuming hydrochloric acid. The solution is then distilled slowly till about 50 c.c. are left. The whole operation takes about 2 hours. All the arsenic is found in the distillate, and is estimated by titration with iodine solution (1 c.c.=0.001 grm. of arsenic) in the usual way.

(To be continued.)

METALS AS FACTORS IN AIR SHIPS.

Their Employment in the Successful Types Now in Use.

It requires no imagination whatever to realize the important part the development of the automobile has played in the metal industry. When it is considered that over 90 per cent. of the weight of an average automobile is steel and metal, we can readily calculate the enormous mass of metal required for the yearly output of these vehicles. The production for 1910 is estimated to be two hundred thousand cars. If we assume the average weight per car to be two thousand pounds there will have to be supplied thirty-six million pounds of steel and metal. Nice figures these, and furthermore the automobile business is only just beginning!

While practically every other industry has felt the effects of the 1907 panic and slow recoveries are now taking place all over the country, the automobile business has pursued the even tenor of its way, and more than held its own. Considering that its product has been in the past more or less of a luxury rather than a necessity, this would be remarkable, were it not for the fact that it simply reflects the confidence felt in the stability of the country by the people at large.

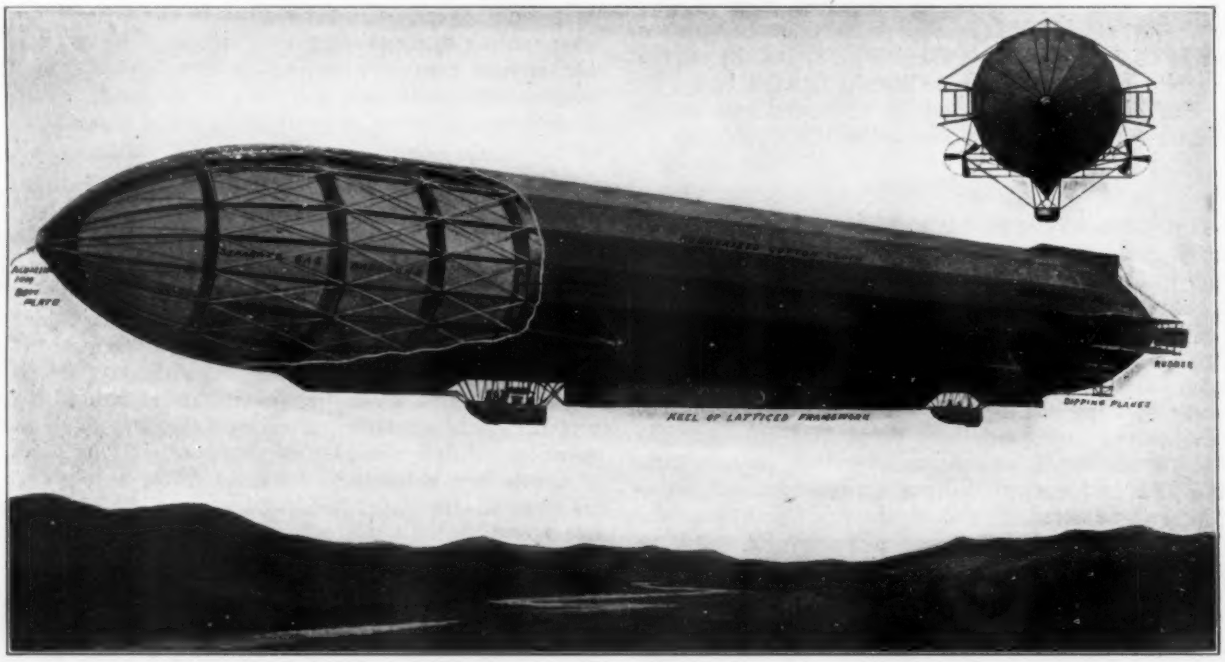
At the present time there is hardly a single concern in the country that has any connection with the automobile trade that has not either just finished an addition to its factory or is building one. From the above it can be seen what an enormous stimulus to every form of industry the manufacture of automobiles has become.

Now that mankind is satisfied that it is possible to annihilate space at hair-raising speed on the ground without a limiting track, it is not at all surprising to note the interest taken in ships of the air. To convert a fast moving motor car into an aero-plane does not seem such a far fetched idea, when we consider that practically the same motor will do for both.

The all important essentials of an airship are of course, first, the elimination or equalization of the force of gravitation, and second, the ability of control when opposed to the varying currents of the air. The first of these requirements is met by prevailing methods in two ways. One the employment of light, expandable gases, as used in the dirigible airships or balloons. The other, by imparting an initial velocity to the machine by mechanical means, as in the aeroplanes. This brings us to the materials of which to build a flying machine.

MATERIALS.

The principal qualities to be sought in a suitable material of which to build an airship are strength and lightness. In this connection, as far as metal is concerned, aluminum has come into its own, and we find it very extensively employed in the construction of not only the airship proper or dirigible balloon, but also in the heavier-than-air machines, known as monoplanes, bi-planes, and various other types of aeroplanes.



Courtesy of Scientific American. FIG. 1. THE ZEPPELIN AIRSHIP, SHOWING CONSTRUCTION.

The most successful of the dirigible balloons, or airship type, is the German Zeppelin II. This airship, a cut of which we show (Fig. 1), as can be seen, is composed of an aluminum frame built of a truss design with tapered ends. It is divided into 17 compartments by vertical partitions, each of the compartments contains a gas bag. All of the metal parts, such as capplate, truss members, tie-rods, struts and strengthening bars or ribs, are made of aluminum or an alloy of this metal. The crank case and carbureter are also of aluminum. The other metals used in the construction, aside from what portions necessarily are of steel, are brass and bronze, which are used only where it is necessary to get the required baring qualities and extreme strength. For instance, the crank shaft of the engine would be made of white brass and the bearings of a high grade phosphor bronze, and so on.

At present, the aeroplane machines are constructed entirely of wood, with the exception of the motor. At

Fig 2 is shown a cut of M. Louis Bleriot in his No. 12 monoplane. This aviator recently accomplished the feat of crossing the English Channel from Calais to Dover, a distance of 18 miles, in 23 minutes. His machine frame, as remarked, was entirely of wood. Had it been of metal and he had entire confidence in its strength, it would have been a simple matter to have flown right back again, or, for that matter, have crossed and recrossed as long as the motor kept revolving.

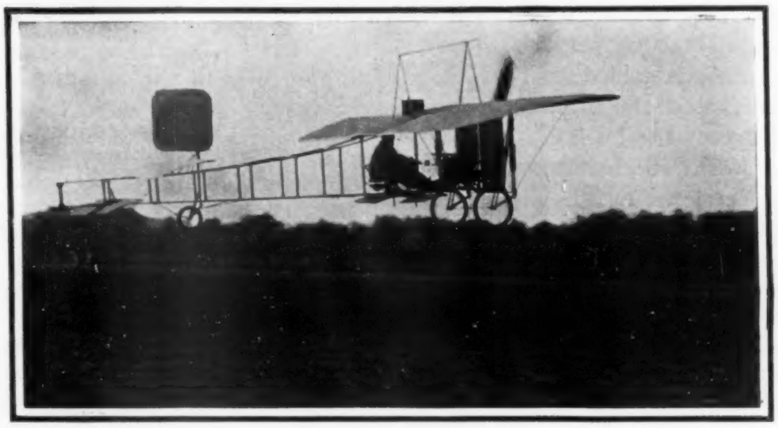


FIG. 2. M. LOUIS BLERIOT IN HIS MONOPLANE.

Courtesy of Scientific American.

In the United States the biplane type, as exemplified by the Wright Brothers, of Dayton, Ohio, is having great success. This machine, as shown in Fig. 3, is also made of wood as to frame, the only metal being in the engine and connections. The latest achievement of this machine being a flight of 56 miles in 1 hour and 12 minutes continuous flying, with one passenger besides the operator, and also traveling a distance of ten miles with two people at a rate of over 42 miles per hour. This machine has now fulfilled all tests and has been accepted by the United States Government.

Speculation as to the ideal form for the successful navigator of the air would lead us to a combination of the present types. The force of gravity rendered nil by the employment of some gaseous compound, and a motive power contained in a small, strong and powerful engine composed of the lightest and strongest alloy known. The frame and webs of the planes, propeller blades and shafts also made of a light yet strong metal, possibly of an alloy yet undiscovered. Such an alloy should have a specific gravity of between 1.5 and 2.5, and a tensile strength of upwards of 40,000 pounds per square inch. It should be entirely free from all oxidation troubles during melting, and be free and easy to work. A metal of this description is now being eagerly sought, and we hope in the near future to be able to record its discovery.

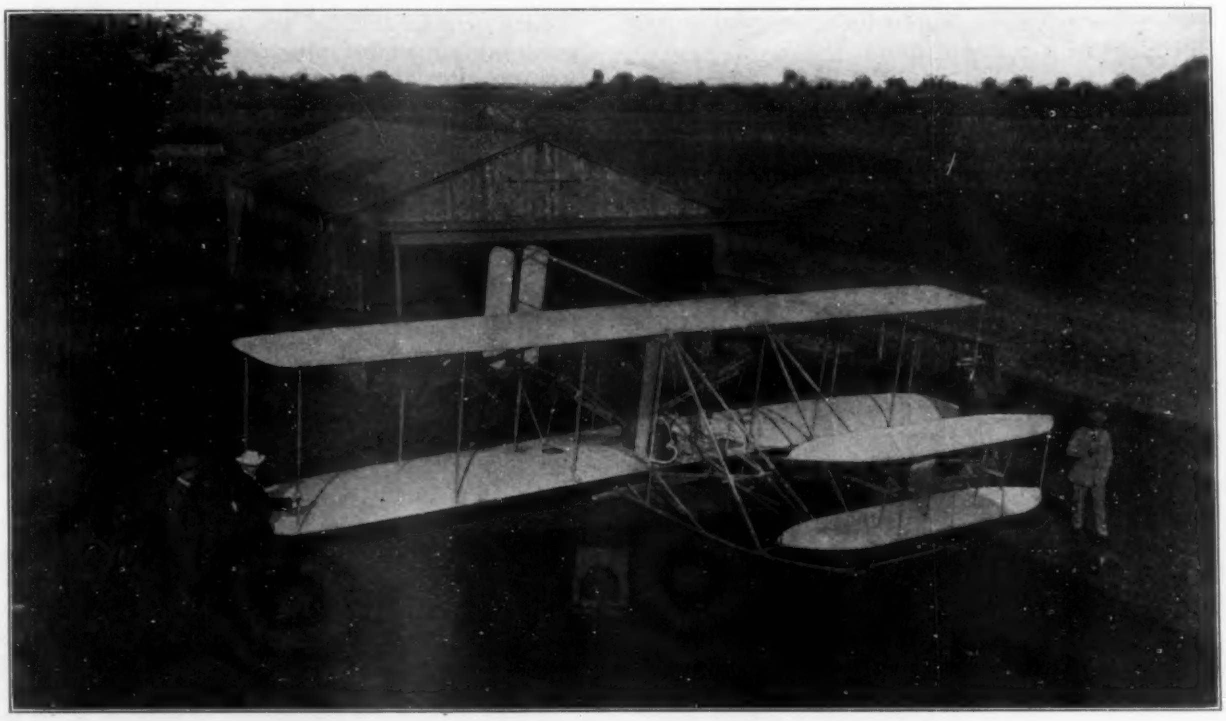


Photo by Edwin Levick. FIG. 3. THE WRIGHT BROS. BIPLANE READY FOR A FLIGHT.

STANDARD SOLUTIONS FOR MANUFACTURING JEWELERS.

By Oscar A. Hillman.

Detailed Instructions for Compounding and Manipulating.

INTRODUCTION.

It is a well-established fact that the formulas for plating and coloring solutions that call for a large variety of chemicals appeal more forcibly to the average colorer than the ones that require only a few ingredients. One of the principal reasons why the illusion exists that the more chemicals added to a solution the better it will work is, that the ordinary colorer has acquired his knowledge of the business by working as an assistant in a coloring room and knows practically nothing about electricity or chemistry. As soon as a solution gets too low in metal or works improperly for any other reason, he is at a loss to undertand why the solution falls down, and invariably commences to dope it up with "conducting salts" (usually some form of soda), and if the addition improves the color temporarily, imagines he has discovered a secret of inestimable value. He promptly sends the valuable secret (?) to all the trade journals he knows of, with the idea that by so doing he is helping his brother colorers, and creating for himself undying fame as a great philosopher.

Another prolific source of fake formula is the unscrupulous consulting plater who advertises to sell infallible formula for every conceivable dip or solution, and if a colorer is foolish enough to send for any of them he receives a receipt that calls for from five to ten different chemicals with a lot of directions for using that are not worth the time it takes to read them. The type of consulting platers referred to can easily be recognized by their advertisements, as they usually advertise to furnish formulas for plating, coloring, lacquering, etc., with such explicit instructions that the amateur plater can send for them and immediately obtain a pleasant, highly lucrative position as superintendent of a coloring room.

TRICKS OF THE FAKIR.

A wrinkle that is commonly practiced by them is to advise the colorers who seek their counsel, to install large solutions and dips so that after the improperly made solutions fall down the colorer has a lot of elephants on his hands that have cost a great deal of money and have been almost useless, so he goes to the consulting plater again and gives him an opportunity to extract another fat fee.

Although some men are capable of doing first-class plating and coloring and understand the proper method of producing a great variety of finishes; when a person advertises the fact that he knows all that is worth knowing about electro-plating and finishing metals, he is either an egotist or intends his advertisements to deceive the people that read it. While any article that has received a deposit of metal from a solution with the aid of an electric current is properly called electro-plated, the word "plated" is universally used to designate articles that have received a heavy deposit; articles that have received only a light film of metal are called "colored."

COMPARISON OF PLATING AND COLORING.

The methods employed to produce a heavy plate differs so widely from those used to color with, that a brief comparison may prove useful. When a batch of work is to be plated it is finished in the rough and receives a heavy plate of the desired metal, the final finishing being done by polishing, bronzing or any other method that does not remove all the plate.

In large factories some of the work goes from the plating to the coloring department to be finished. When work is sent to the colorer it is up to him to finish it ready for the shipping room, except work that is to be engraved or assembled. Another great difference is in the quantity and price of the metals used, as a plater usually handles only the cheaper ones, such as brass, copper, nickel, etc., while a colorer uses silver, gold and platinum. It can readily be seen from the above facts that the colorer has by far the most exacting and difficult position of the two, as he is responsible for the quality of the finish and must be able to account for every pennyweight of riety of finishes than the plater who has only to obtain good smooth deposits that shall approximate metal used, besides having to produce a greater va- a certain weight.

MACHINERY USED.

The dynamos used in the departments are constructed entirely different, as coloring and plating cannot be done successfully with the same type of machine. Although some factories use the same dynamo for both kinds of work, they are not the ones that are noted for the quality of the finish on their products and will sooner or later find out their mistake. The best dynamos for plating are compound wound and deliver a certain voltage regardless of the number of amperes used (except if overloaded), and are almost useless for coloring with hot solutions. The most efficient dynamo to use for coloring operations, where the work is held in the solutions for a few seconds only, is shunt wound and drops its voltage in proportion to the amperes used.

These comparisons of the two branches of the art show that a man may be a first-class plater and yet know nothing about coloring. As it is the colorers that are most imposed upon by people who, through ignorance, or a desire to mislead, sell or cause to be published, formula and directions for doing certain work that are so obsolete and ridiculous that they are a reminder of the days of the alchemist and spagyrist. This series is written to show the folly of using superfluous chemicals when compounding a coloring solution as well as to describe the way to use the essential ones.

(To be Continued.)

WORLD'S PRODUCTION OF ALUMINUM.

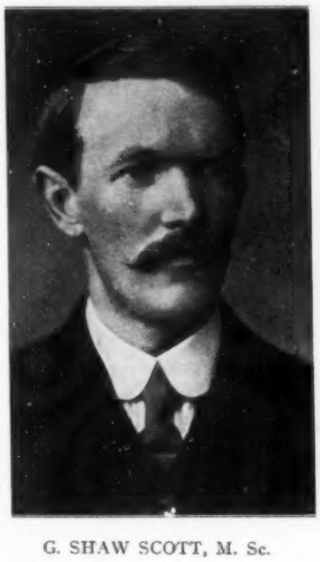
The world's production of aluminum in 1908 is placed at 56,000,000 pounds compared with 42,000,000 pounds in 1907 and only 20,000,000 pounds in 1905. The average price declined from $1,000 per ton in 1906 to $500 in 1908, with current quotations not far from $300 per ton.

The most favorable estimate of the bare cost of production at present is $300 per ton, while it is believed that the larger number of operating aluminum plants cannot produce the metal under $400 per ton, or 17 cents per pound. In this estimate no allowance is made for interest or capital or depreciation.

THE FIRST YEAR OF THE INSTITUTE OF METALS.

By G. Shaw Scott.*

Specialization not only applies to manufacturing and journalism but also to technical institutions. A hundred years ago the Institution of Civil Engineers answered for the needs of all workers in the field of applied science. It was an Institution that embraced in its wide membership men interested in railway engineering, in canal and harbor construction, in the early attempts towards the harnessing of the lightnings; and for a time it sufficed. But as the nineteenth century grew older, engineering science advanced in an extraordinary degree, with the natural result that engineers found that their interests became specialized. No longer was it possible for any one man to be fully primed with information in all branches of engineering, hence came the inevitable subdivision leading to the formation of The Institution of Mechanical Engineers, The Institution of Electrical Engineers, and other societies devoted to various industries.



G. SHAW SCOTT, M. Sc.

Later it was found that the industrial importance of iron and steel was so great that there became the need for still another specialized institute which could devote its energies entirely towards the investigation of the multitudinous problems confronting users of these metals, and hence in 1869 there came into existence the Iron and Steel Institute. For many years these important scientific institutions have been carrying on eduational work of the highest order, but strangely enough they have been left to share amongst themselves the investigations of the non-ferrous metals, as there was no institution of any sort—as there was no newspaper—devoted entirely to helping the worker in those fields of metallurgy embracing such important industrial metals and alloys as copper, brass, tin, zinc, aluminium, lead, nickel, etc. For years, therefore, the makers and users of the non-ferrous metals (with the exception of gold, silver and other precious metals, which to a certain extent was dealt with by the Institution of Mining and Metallurgy), have been in the dark, with no recognized body at hand to further their special interests and no organ to represent their views or focus their ideas. The deficiency has been very seriously felt, especially when it was realized that before the establishment of the Iron and Steel Institute the iron and steel trades were in much the same position of unenlightenment and misguided "secrecy" as is the metal trade of to-day. A year ago it was realized that the time was ripe for still further specialization in our technical scientific organizations, and the result, as all of our readers are probably aware, was the formation, under the most able presidency of Sir William H. White, K.C.B., F.R.S., of the Institute of Metals. This new institution has now been in existence just a year, and it is fitting, therefore, to review the work that has been accomplished during the past twelve months, and to consider what may be expected to be the effect of such a scientific institute upon the metal trades over whose special interests it is our privilege and intention to keep the closest watch.

The Institute of Metals has held two meetings, the first in Birmingham in November last, and the second in London in January of this year. At both these meetings there were presented and most thoroughly discussed, many papers of the scientific and practical character, and these have recently been published, together with the discussion and many written contributions in the Institute's journal. The first volume of the Journal of the Institute of Metals is a most valuable work which at once places the new Institute in the very front rank of allied institutions. No other institution in its first year has ever published such a creditable volume of proceedings, and for their courage in striking out along these advanced lines, the council of the Institute is to be congratulated. No finer evidence of the need for the Institute of Metals is required than is afforded by a persual of the erstwhile historic "List of Original Members" which is contained in the journal. Therein every branch of metallurgy is found to be represented, from man in charge of a large brass foundry to the master-mind of some great metal corporation. The advance in number during the past twelve months is further evidence of the need there was for such a specialized scientific institution, the figures are furnished by the secretary, showing a membership of two hundred in July 1908 as compared with 500 in July 1909.

By far the most valuable work of the Institute will consist in helping to break down the absurd barriers of secrecy that surround practically all the metal trades. What is wanted in these days is not for every man to be working fearfully along his own lines, avoiding all publicity and interchange of ideas, but rather the broader outlook that realizes how much more is almost certainly to be gained by freely discussing the trade problems with which one is faced than by endeavoring to keep from a potential rival methods which probably are equally well known to, if not actually discarded as obsolete by manufacturers in a similar line of business. Our British metal manufacturers have still a great deal to learn in the direction of free interchange of ideas and the adoption of scientific methods in their establishments. This fact was impressed upon us a few days ago on hearing the experiences of a British metal manufacturer who recently undertook a tour of the United States of America for the purpose of studying the industrial conditions prevailing in the metal trade on the other side of the Atlantic. On arriving at the well-known brass foundry he sent in his card, asking to see the president of the company. Immediately the president came forward, placed himself at the English visitor's disposal "for the afternoon" and commenced a thorough tour of the huge establishment, showing everything of interest, including the perfectly equipped laboratories with their numerous recording pyrometers, all working in conjunction with those in the melting shops, the various methods of assay, the large and airy metal store rooms, the furnace rooms, moulding departments, finishing shops, etc. The whole atmosphere seemed to differ from that of the typical secretive British establishment, where one often finds considerable difficulty even in approaching the principal, let alone attempting to obtain permission to go over a works which could

*Secretary of the Institute.

not compare in up-to-date methods with such a foundry as we have outlined.

The British metal manufacturer as a class still seems to think that he can depend on rule of thumb and dispense with the services of a trained scientist. In this connection it is remarkable to note that in the "jeweller's quarter" of Birmingham, which is the greatest centre in this or any other country, of the goldworker's trade, there is, if we except those of the bullion dealers, not a single laboratory where there can be scientifically investigated the numerous problems that must continually be occurring in connection with the alloying, casting and working of the precious metals. Such a state of affairs is incredible, and would certainly be impossible to equal in the United States or Germany. However, not all our metal manufacturers leave so much to chance, for many of the large copper, brass, zinc, tin, nickel, and aluminium firms have well equipped laboratories and trained scientific staffs. This is particularly to be noticed in connection with a comparatively new industry—the manufacture of motor cars. The automobile is undoubtedly a triumph of the metallurgist, and the growing reliability and popularity of these machines is due largely to the excellence of the materials which the laboratories of the great firms, such as the Daimler, Argyll, Humber, etc., are continually evolving and testing.

The idea of applying science to metallurgical problems is growing, but it needs the helping hand of such a body as the Institute of Metals. It is also necessary that those engaged in the metal trades should have an organ which should represent their views, and to record all that is being done, not only by scientific investigators but also by the practical men such as those actually engaged in the non-ferrous metal trades. The establishment of The Metal Industry, the journal which is the organ of the metal trade, marks an important phase in the progress of non-ferrous metallurgy.

Of the future of the Institute of Metals we have no misgivings. The Institute has already more than justified its existence and is bound to become more and more indispensible to the British metal industry as the years advance. Its activity, if we may make a suggestion, should ultimately embrace research work similar to that undertaken by the Alloys Research Committee of the Institution of Mechanical Engineers. Such work, we know, is costly, but we may hope that so great will be the accession of membership as the potentialities of the Institute are realized that the financial difficulty will no longer exist.

DISEASES OF METALS.

Three classes of diseases of metals were defined by a recent lecturer at the Royal Society of Arts in London. The first class—"diseases of treatment"—embraces metals that are correct in composition and otherwise satisfactory in quality but have been made weak or unsuitable by improper heating or mechanical treatment, either by the user or producer. "Diseases of composition," which form the next class, result from the presence of substances that should either be absent or present in a smaller quantity. The third class is "diseases of decay." This depends on the action of outside causes, chemical or mechanical, that lead to deterioration.

TRUE BRONZE.

A true bronze is composed of copper and tin in which any other metals present have been introduced by accident, as for instance, through impurities in the copper.

RECOVERY OF PRECIOUS METALS FROM CRUCIBLES.

By Joseph Cauffman.

As supplementary to my series of articles on The Recovery of Precious Metals from Jewelers' Waste, published in The Metal Industry* from January to May, 1909, it seems advisable to add a short description of the method for handling used crucibles. I am afraid, however, that there is no process by which private individuals or small shops can do this work to advantage, as these crucibles offer the most refractory material of all residues, and I do not see how they could be handled except in the blast furnace; if handled even in the most favorable way in crucible melts, it would be necessary to work with such small quantities in each melt that the process would be almost interminable. The materials constituting the crucibles are of such character that it takes a great quantity of flux to make them melt and run free, and this condition is absolutely necessary in order to make the precious metals separate. The only way to handle such residue, according to my experience, is to send them to some large smelter who is familiar with this work, and who has the proper facilities for handling the material. The crucibles can be sent just as they are, but a much more satisfactory way is to proceed as follows:

Break or crush the crucibles in a tumbling barrel; this is the best way, but if no barrel is at hand a mortar must be substituted. This will do the work, but it is tedious and slow. The material should be crushed or ground repeatedly, until it will all pass through a pretty fine sieve. It should then be sieved, which leaves all the larger particles of gold and silver on top of the sieve, and these can then be melted down and recovered. Any small amount of crucible materials that remains with them will be absorbed in the slag of this melt, so a little will not matter; but the metallics should be as clean as possible before melting, no large pieces of crucible being left with them, as they interfere with the melt. The finer the sieve employed the more metallics will be recovered; but this, of course, necessitates a greater amount of grinding to make it pass through the sieve.

The sieved material represents the body of the crucibles, with more or less precious metals, the latter in very fine globules, etc. This material, when composed of said crucibles, looks very much like ordinary river sand. It is now ready to assay; if the owner is familiar with this process he can ascertain for himself about what the "sand" is worth; and with or without this process, he can send a sample to the smelter for an offer, if he wishes to sell it, or for an estimate for working it up and returning the metal. If desired, the owner can, of course, send samples to two or three different concerns and sell to the highest bidder.

In handling this material precautions are to be observed as described for the various processes in the article on Sweeps, etc.

BRONZE AGE IN EUROPE.

We have no record of any period in the history of the Aryan people in Europe when iron was unknown; so that strictly speaking, the bronze age as applied to these people covers that period when the use of bronze was given preference for weapons and implements, on account of the lack of sufficient knowledge to work iron easily and profitably. This statement does not apply to the Egyptians and Chinese, whose history dates back beyond the Ayran immigration into Europe.

*American Edition.

EDITORIAL

OLD SERIES Vol. 15, No. 8. NEW YORK, AUGUST, 1909. NEW SERIES Vol. 7, No. 8.

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COPPER AND BRASS

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ADVERTISING RATES ON APPLICATION

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CONTENTS

PROCEEDINGS OF ASSOCIATIONS.

The Journal of The Institute of Metals, London, England, which has just been issued, is a most valuable production. A volume of 310 pages, bound in green cloth with gilt lettering, it certainly reflects great credit upon the secretary, G. Shaw Scott, M.Sc., who edited it. The book contains rules of the Institute, list of officers and members of the Institute, reports of work, visits, addresses, papers read on various metallurgical subjects, and also all the discussions by the members; in fact gives a complete history of the formation of the Institute and of its progress for the year. An excellent report of the inception of the Institute and its objects is given by the secretary and published in another column of this issue of THE METAL INDUSTRY.

The Institute is now a year old and its success was assured from the start, due not only to the character of the people interested, but to the active enthusiasm shown by all concerned. It is certainly noteworthy that a new organization can arouse such lively interest, as to cause busy men of affairs to stop and write or prepare a paper or address to be placed before the members. Some of the papers were of particular value to the nonferrous metals trade. The papers together with their discussion included in the book are: "Aluminum and Some of Its Uses," by J. T. W. Echevaire; "Notes on Phosphor Bronze," by A. Phillip, Admiralty chemist; "The Mechanism of Annealing in the Case of Certain Copper Alloys," by G. D. Bencough and O. F. Hudson; "Some Points of Interest Concerning Copper and Copper Alloys," by F. T. Milton; "Metallographic Investigation of Alloys," by Walter Rosenhain, of the National Physical Laboratory; "Intermetallic Compounds," by Cecil H. Disch; "Plant Used in the Manufacture of Tubes," by W. H. A. Robertson; and "The Relation Between Science and Practice and Its Bearing on the Utility of The Institute of Metals," by Sir Gerard A. Muntz. Several of the above papers have been published in the American edition of THE METAL INDUSTRY.

When the Institute was in process of formation, there was considerable skepticism expressed as to the matter of trade secretism. The general idea seemed to be that works managements in general would be rather slow in welcoming visitors to their plants. Even the president (Sir William White, K.C.B., F.R.S.) expressed some doubt in the matter in the fore part of his presidential address. Contrary to the general opinion, however, a surprising number of plants were thrown open and opportunities given for all to go through, even some of the largest and hitherto most conservative. This is one of the main objects of the Society, and from present indications bids fair to result in a more thorough understand-

ing between theoretical and practical science. In this country this idea of the open door is rapidly becoming more prevalent, particularly so in the West, and it is safe to predict that in the near future open discussion of perplexing problems of manufacturing operations will be welcomed and participated in by all.

The publication and distribution in bound form of all papers and reports of discussions by the various societies, will go far towards bringing this about. One of the most important of the duties of a secretary of an association, is to secure not only papers but discussions on the same from members on subjects relevant to the industry to which his association is devoted.

After all the Institute of Metals in its first year of existence has set an example, which our own associations will do well to follow, particularly as to discussion.

ZINC-COPPER ALLOYS.

In these days of hustling industrial progress one need not be surprised at the number of new things being daily brought to notice. By far one of the most interesting processes yet noticed is the subject of a recent patent, issued July 13, 1909, by the United States Patent Office to Sterling Elliott, of Newton, Massachusetts. The patent is entitled, PROCESS OF MAKING ALLOYS OF ZINC WITH COPPER. This is a most remarkable process, and is entirely at variance with the recognized rules of metallurgical practise. Perhaps the process is best described in the words of the inventor himself:

> The object of the invention is the production of the alloy at a temperature much less than the melting point of copper, whereby the expense of production is very materially decreased and numerous other advantages gained incident to the employment of the greatly reduced temperature as compared with the temperature ordinarily employed.
>
> In carrying out my process I first melt the zinc, then add the copper to the molten zinc and then raise the temperature to the melting point of the alloy which is to be produced or thereabout, which is less than the melting point of copper and also less than the boiling point of zinc. The affinity of the zinc for the copper causes the latter to be absorbed or dissolved to some extent, even when the zinc is barely melted, and this effect is more marked in proportion as the pieces of copper are smaller in size, for the reason that a greater surface of copper will be exposed to the action of the molten zinc. However, I continue to raise the temperature of the mass until it reaches the melting point of the alloy which is to be produced or thereabout, to obtain an alloy having a perfectly homogeneous structure. For example, assuming the melting point of zinc to be 412° C. and its boiling point 1,040° C. and the melting point of copper to be 1,090° C. and the melting point of alloy which is to be produced to be 973° C. it will be noted that when the copper is placed in the molten zinc at 412° C. it begins to dissolve, but even so the temperature is raised to 973° C. or thereabout, which, it will be noted, is less than the melting point of the copper and also less than the boiling point of the zinc, yet is high enough to produce an alloy having a perfectly homogeneous structure. In carrying out my process the zinc and subsequently the alloy will be covered with any well-known or suitable flux, such, for instance, as charcoal or borax.

It is a well-known fact that zinc and other low melting point metals will absorb a small amount of higher melting point metals, such as copper, etc., but only to a limited extent. No chemical alloy is formed, but merely a mechanical mixture. Now if we attempt to introduce a larger amount of copper in order to produce a real alloy we must necessarily raise the temperature, and this results in an over-oxidation of the zinc, causing loss by oxidation, as zinc has more affinity for oxygen than for copper, and also than copper has for oxygen. We might possibly form a small amount of the alloy $CuZn_8$, copper 10.82 per cent., zinc 89.18 per cent., but it more likely would be a small amount of $CuZn_2$, copper 33.34 per cent., zinc 66.66 per cent., or, according to the amount of copper used, $CuZn_3$ and $CuZn_4$, with the balance free zinc to be oxidized.

We would have, therefore, exactly the same condition which in the brass-making business every one is striving to avoid, i. e., "stewing" of melted metal in the fire. There does not seem to date to be any allowable departure from the true method of making alloys by melting the higher melting-point metal first. It would be interesting to see some micrographs of these zinc-copper alloys (?) made by this new process compared with the regular made alloys of identical chemical composition.

Furthermore, the commercial value of any alloys made in this way are to be doubted. Possibly some form of ornamental castings could be turned out, but their homogeneity would be of a negative character.

AN ASSOCIATION, NOT A UNION.

There has been considerable agitation and discussion of late regarding the National Electroplaters' Association, now in its infancy, as to whether it is a union or labor organization, or otherwise. The association, as its constitution states explicitly, was founded for purely educational and social reasons. The main object of the organization is the free and open discussion of all subjects relating to the industry of electroplating. No idea of unionism has ever entered into the plans of the organization other than to benefit the members of the electroplating profession.

In so far as "IN UNION THERE IS STRENGTH" applies to the uplifting and betterment of the industry, this is just exactly what the association stands for. The pamphlet now being circulated by the secretary, and which was published in the July issue of THE METAL INDUSTRY, very ably and clearly sets forth the reasons for the existance of the organization.

The very fact that the constitution states that "Active members shall consist of supervisors, general foremen and foremen of electroplating and finishing departments," furnishes ample evidence of the character of the association. Incidentally among other important results from the work of this society, will be the general elevation of the efficiency of the members. This must sooner or later demand higher rates of recompense, but it will simply be the fulfilment of the trite saying, "The workman is worthy of his hire."

THE USE AND ABUSE OF CHARCOAL IN MELTING BRASS.

The Real Metallurgical Reasons for Using It.

While many articles have been written regarding the use of charcoal as a deoxidizer in the manufacture of brass, the real fundamental principles of the process are often overlooked. This being the case, when some one not thoroughly familiar with chemical reaction tries the scheme, the results not being satisfactory, the process is condemned as wasteful and expensive, though through no fault of the material used.

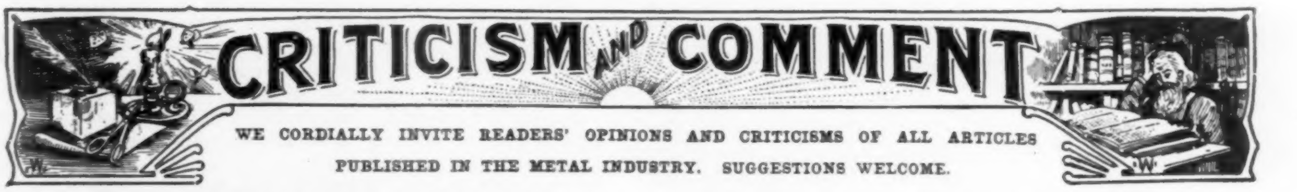
As is well known, copper the principal component of brass, is very susceptible when in the process of melting, to oxygen. It thereby forms the first of a series of oxides, cuprous oxide or CuO, this oxide the metallic copper is capable of dissolving. The mixture thus made renders the resulting brass cold short, or brittle while cold, and as practically all brass mixtures are worked cold, this is very detrimental to the successful manufacture of good brass.

When charcoal (chestnut size is best) is added to a pot of brass or bronze a partial oxidation of the carbon of the charcoal takes place at once. This is due to the combination of the carbon with the oxygen of the draft and forms carbon monoxide, or CO. Carbon monoxide is an excellent reducing agent in that it takes up an additional molecule of O, and forms thus carbon dioxide, or CO_2. This second portion of oxygen is derived from the metallic oxide already formed by the metal. This reaction would be expressed by the formula $CuO + CO = CO_2 + Cu$. The carbon monoxide, therefore, robs the copper oxide of one molecule of oxygen, thus liberating the copper in its original state.

Now we come to the real important stage of the process. It must be kept in mind that when the carbon dioxide has been formed this is as far as the reaction can go. If means are not now provided for the retention of the protective cover of carbon dioxide, we will speedily find that our charcoal is used up and the copper will oxidize as before.

The remedy lies in not filling the pot with molten metal to within more than two inches of the top. This gives an opportunity to keep a layer of charcoal completely covering the metal, and what is more important, a *layer* of carbon dioxide gas completely filling this space and effectively preventing further oxidation.

Carbon dioxide—carbon anhydride—carbonic acid gas is a heavy invert gas that does not support combustion. It has a specific gravity of 1.52, hydrogen being .062, a vapor density of 22 where hydrogen is 1. If the metal in a crucible is level with the top (as is often the case) the heavy carbon dioxide formed at the expense of charcoal is immediately forced over the edges of the pot and its valuable effects are lost. By observing this very simple precaution there is no flux or deoxidizer for brass easier to apply than charcoal, but as can be seen, it is equally as easy to sidetrack its most valuable quality.



THE PATENT CONTROVERSY OVER BEARING METALS.

To the Editor of The Metal Industry, New York:

With reference to the letter published in the July number of The Metal Industry* from Mr. Andrew Allan, Jr., of A. Allan & Sons, New York, regarding the patent controversy over Bearing Metals, in which he says:

"The art of amalgamating copper and lead in any desired proportion, with or without the use of tin, was invented by Andrew Allan, Sr., in 1876."

I wish to call attention to a book written by Johann Tenner, and published in the year 1860, page 116, entitled "Handbuch der Metall. Legirungen," in which Tenner gives a method of making homogeneous copper-lead alloys, using a mixture of cream of tartar or argol as a flux. I have personally examined this book. It is in the Library of the Columbia University. He speaks of the alloys having previously been patented in France. It is true that no mention is made of the use of these mixtures for bearings, but I do not think that Mr. Allan's contention is well taken, because it is a fact that copper-lead alloys containing from 20 to 25% of lead and their method of preparation are distinctly mentioned by Tenner in 1860, or 16 years prior to the alleged invention of Andrew Allan.

Guettier, in his "Guide Pratique des Alliages," published in 1865, described the properties and preparation of copper-lead alloys containing from 1% of lead up to 99%, the balance being copper, and used an alloy of 50% copper and 50% lead as the best means of making such alloys.

Chas. M. Reubens
(S. Reubens & Bro.).

New York, July 19, 1909.

*American edition.

A SUBSTITUTE FOR PLATINUM CHLORIDE IN COLORING OF SILVER.

To the Editor of The Metal Industry:

I notice in the July number of The Metal Industry an article by J. J. MacManus, upon a substitute for platinum chloride, used in coloring silver. As I have had considerable experience with the oxidizing fluid given by Mr. MacManus, I am in a position to differ with him upon the oxidizing not fading out. While the oxidize is very cheap and it will give a black equal to platinum, it will fade out within one month, and turn to a gray white color, which no doubt is due to the arsenic changing to white arsenic. I have used this fluid upon silver and silver plated jewelry and had every piece that was oxidized with it returned to me to be refinished after laying but one month, and all the articles were given a good coating of lacquer, the color fading under the lacquer. I have experimented extensively with this solution, but have never been able to overcome to a satisfactory degree this bad result. I believe it will fade as long as arsenic is one of the agents used.

If any reader of The Metal Industry has tried this formula and had some of the articles oxidized with it laid away for one month, I should like to hear his verdict of the fluid; more so if he had oxidized large quantities of goods with it. I am sure the atmosphere in his vicinity will be of a dark blue nature.

Wm. Voss.

Brooklyn, N. Y., July 20, 1909.

The above formula has been not only tried out experimentally but is in daily use in a number of plating establishments. Perhaps our correspondent failed to thoroughly eliminate all the acid so that silver chloride was formed on the work.—Ed.

Shop Problems

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE OF THE METAL INDUSTRY. ADDRESS THE METAL INDUSTRY, 61 BEEKMAN STREET, NEW YORK.

ALLOYING

Q.—We would be obliged if you would let us know the best alloy to put in aluminum for castings, that will make a strong and tough metal for machine bases.

A.—Aluminum alloys should first be run down into ingots and then remelted before pouring into castings. A good mixture is the following:

No. 1 Notched Bar Aluminum....	80
Bertha Zinc	11
Yellow Brass Sheet	7
20% Manganese Zinc	2

The thorough alloying of aluminum alloys is difficult, and we would recommend that you obtain your ingot from the maker of such alloys.—J. L. J.

CASTING

Q.—In making aluminum castings we are troubled with black specks in the face of the casting and the casting is very rough in front of the gate. What is the trouble?

A.—We are of the opinion that all other conditions being good the specks you complain of in aluminum castings are due to over oxidation while the metal is being melted. Aluminum is very readily oxidized while in a molten condition, and if not carefully handled will give just the trouble that you complain of. If you will observe the following we think there is no doubt but what you will overcome the difficulty: Use a mixture of 70 lbs. of aluminum, 27 of zinc and 3 of copper.

Melt half the aluminum and feed in the copper in the form of small chips or pieces of wire; add the remainder of the aluminum and allow to become thoroughly melted; then gradually add the spelter, cover with broken charcoal the size of chestnuts and remove from the fire. The temperature should be 1200 degs. Fahr., add a handful of nitrate of potash, stir vigorously with a graphite stirring rod and skim off the dross; pour carefully and rapidly and your castings should be free from specks. The rough portion in front of the gates is probably due to the fact that your gate is not quite large enough; we should advise increasing it. Dust the finished mold with powdered talc or soapstone, which greatly improves the surface of the casting.

CORRODING

Q.—Which will be better so as to resist the corrosive action, especially of alkaline waters, to have our float made of copper tinned, or of low-brass tinned? What do you mean by an "acid metal?" Is it metal which will resist corrosion of acid waters but not of alkaline waters, or would it be better for alkaline waters even than the mixture of nine copper and one tin suggested? Kindly give us the composition of plastic bronze.

A.—(1) Most sheet copper is tinned by swabbing it over with chloride of tin solution. This gives an extremely thin coating that affords little protection against corrosion. A much heavier coating could be obtained by dipping the sheet copper into a pot of molten tin or solder. If the copper is clean there will be no trouble about the tin adhering to it. There is no reason why molten tin should adhere to low brass better than to copper, while if the tin coating on the low brass was once eaten through, the brass on account of the zinc would not last as long as the copper. I noted recently in a water-closet hopper that a brass pin had been entirely eaten through while the copper was still all right. (2) Plastic bronze contains copper 63, lead 29.5, tin 4.5, nickel 1. It is rather hard to mix and had better be bought in ingot form from the maker. It has a tensile strength of about 20,000 lbs. per sq. inch and would be excellent to resist corrosion of water containing sulphuric acid. It will not resist alkalies so well. "Monel Metal"—nickel 70, copper 30—is hard and strong and ought to resist alkalies better than either the plastic bronze or copper 9, tin 1. It is a by-product and comparatively cheap.—J. L. J.

DIPPING

Q.—We are running a hot copper solution with which we plate steel door knobs in the same tank that current cleans off grease, and find difficulty in putting on a coat which is as durable as a cold cyanide process. Can you give any mixture which will harden the copper coat and not retard speed? Are using a large iron kettle with XXX lye, carbonate of copper and a little cyanide added.

A.—To produce satisfactory results it will be necessary to arrange for the copper plating of the articles in a separate tank. Success cannot be accomplished by trying to cleanse and plate in the same solution. Your present method is practically the electro method of cleaning, but by the addition of carbonate of copper, which the cyanide holds in solution, you are enabled to get a copper deposit, but so thin we should imagine that it amounts to but a wash over, as such deposits are commonly called. Try the following formula and you will obtain excellent results:

Water	1 gal.
Cyanide of potassium......................	5 ozs.
Red copper compound......................	2 "
Bisulphite of soda..........................	2 "

Or:

Water	1 gal.
Carbonate of copper........................	3 ozs.
Cyanide of Potassium......................	6 "
Carbonate of soda..........................	2 "
Sulphite of soda...........................	2 "

Use anodes of soft copper either cast or rolled.—C. H. P.

FINISHING

Q.—How is the finish upon the enclosed gun hammer produced?

A.—The finish upon the gun hammer is produced by the Bower-Barff method which is as follows: The articles are placed in a closed retort and heated to a temperature of 1040 degrees, steam superheated is then injected from 4 to 6 hours producing a coating of black magnetic oxide. The articles can be polished in the usual manner with cloth buff wheels and then wiped with linseed oil or by immersing in parafine oil, used hot. One of the latest methods recently patented is to boil iron or steel articles in a 10 to 20 per cent. solution of phosphoric acid until the articles are sufficiently coated with a uniform black. The methods mentioned would not be satisfactory for your purpose, especially when soldered together. The following method may answer. Prepare a solution of:

Sulphate of copper....................	4 ozs.
Oil of Vitriol..........................	1 oz.
Water	1 gal.

Cleanse the barrels with potash of soda to remove the grease. This may be done with a sponge, cleanse with water, then apply a little of the copper solution to a sponge and pass quickly over the barrel, a copper tone will result.

To produce a bronze tone dissolve one ounce of liver of sulphur in one pint of water, use this as a stock solution; now add a little of this to water and after sponging off the excess of copper solution with clean water apply a little of the diluted liver of sulphur solution with a sponge as quickly as possible until a dark steel coating results, cleanse as before and if a dead coating is required simply lacquer or wax the surface with beeswax dissolved in turpentine and apply with a

rag. A more bluish tone may be produced by dissolving solution of chloride of antimony (the butter of antimony of commerce in any vegetable oil such as a cheap grade of olive oil), apply as previously mentioned to the coppered surface, lacquering will not be necessary in this case.—C. H. P.

Q.—How is a satin like ormolu finish produced on brass and copper?

A.—To produce satin like ormolu finish on brass and copper, dissolve 6 ounces of sheet zinc in every gallon of 38 degs. Be. aquefortis used. After the zinc is completely dissolved add slowly and carefully an equal amount of oil of vitriol. The mixture should be made up in an earthenware crock, which is placed in warm water; the dip should be continually stirred while in use, and kept warm. If it should fail to work satisfactorily at once, add a small quantity of water and muriatic acid. If the work should come out too smooth, add a little more aquafortis; if too coarse, add a little more oil of vitriol. The above formula is for brass and copper alloy mixture.—C. H. P.

GILDING

Q.—How can I successfully produce the French gilding or ormolu gold, as we see on clock trimmings?

A.—The French gilding, or omolu gold, as more commonly called, and noted upon novelty clocks and other articles which are usually made of soft metal, such as the alloy of lead and antimony, is produced as follows: The articles are plated in an acid copper bath for one-half hour. The bath consists of:

Sulphate of copper	1¼ lbs.
Sulphuric acid	2½ ozs.
Yellow dextrine	¼ oz.
Water	1 gal

Anodes of soft copper are used and a current strength of 1½ to 2 volts. After plating the articles are usually dipped in an acid dip, such as is used for bright dipping brass goods, but for this purpose should an excess of sulphuric acid, two parts sulphuric to one part of aqua fortis will answer, but an old dip is the best for the purpose, on account of its slower action. The articles are washed and run through the cyanide dip, and then flashed for a few seconds in a warm brass solution; this gives a brassy tone to the copper, and avoids using an excess of gold. The articles are now gilded in the regular manner in a good yellow gilding solution, those containing sodium phosphate are most suitable. After washing and carefully drying the high lights are hand burnished and finally lacquered with a transparent water dip lacquer. Upon bronze hardware the matt effect is produced by the sand blast, then acid dipped, the high lights polished or burnished and then gilded in the usual manner, and lacquered. But many concerns acid copper brass or bronze hardware, due to the fact that it is much easier to burnish the soft copper deposit produced in the acid copper bath.—C. H. P.

Q.—Please explain how fire gilding is done, and if articles so plated can be replated when gold is worn off?

A.—Fire gilding is done by polishing the articles to be colored until they are smooth and bright; then, after cleaning as for plating, they are dipped in an amalgam made by dissolving one ounce fine gold in seven ounces of mercury, rinsed in hot water and immediately laid on a clean sheet of iron and heated to a dull red until all the mercury has been volitilized and the work looks black, then dip in a pickle composed of one part sulphuric acid and six parts of water until the articles have a fine gold color when they are ready to wash and dry.

Articles that have been colored by the above method can be recolored provided they are first polished bright then washed perfectly clean. Fire gilding is a very expensive, unsatisfactory method of coloring and is now never used.

Would suggest a salt water solution, as it is much cheaper and gives a richer color.—O. A. H.

MANUFACTURING

Q.—Will you tell me how to make oxide and nitrate of silver?

A.—The oxide of silver is made as follows: Take of nitrate of silver 4 oz. Troy; distilled water, half a pint; solution of potassa, 1½ pints, or a sufficient quantity. Dissolve the nitrate of silver in the water, and to this solution add solution of potassa so long as it produces a precipitate; wash this repeatedly with water until the washings are nearly tasteless; lastly, dry the precipitate and keep it in a well-stoppered bottle, protected from the light. To make silver nitrate, proceed in the following manner: Take of silver in small pieces 2 oz. Troy; nitric acid, 2½ oz. Troy; distilled water, a sufficient quantity. Mix the acid with a fluid-ounce of distilled water in a porcelain capsule, add the silver to the mixture, cover with an inverted glass funnel, resting within the edge of the capsule, and apply a gentle heat until the metal is dissolved and red vapors cease to be produced; then remove the funnel, and, increasing the heat, evaporate the solution to dryness. Melt the dry mass and continue the heat, stirring constantly with a glass rod until free nitric acid is entirely dissipated. Dissolve the melted salt, when cold, in six fluid-ounces of distilled water, allow the insoluble matter to subside and decant the clear solution. Mix the residue with a fluid-ounce of distilled water, filter through paper and having added the filtrate to the decanted solution, evaporate the liquid until a pellicle begins to form, and set aside in a warm place to crystallize. Lastly, drain the crystals in a glass funnel until dry, and preserve them in a well-stoppered bottle. By evaporating the mother-water more crystals may be obtained.—J. L. J.

Q.—Please give me a good method for making copper carbonate from commercial bluestone or copper sulphate.

A.—Copper carbonate is produced in the following manner: Dissolve any number of pounds of commercial sulphate of copper in as small amount of boiling water necessary for a solution. A glazed earthenware pot or wooden barrel can be used for the purpose. Stir the copper to assist solution. Now in a separate receptacle place carbonate of soda, the weight of which should be slightly in excess of the copper; dissolve the soda also in boiling water. When both soda and copper have completely dissolved, add the soda solution to the copper solution at short intervals. Care must be exercised in this operation, owing to the rapid evolution of carbonic acid gas. When all the soda solution has been added to the copper solution the evolution of the carbonic acid gas will cease; stir thoroughly and allow to settle for an hour or more; afterwards syphon off the clear sulphate of soda solution from the precipitated carbonate of copper (this is of no use, and can be thrown away). Add hot water again to the carbonate of copper precipitate and stir well, allow to settle again, and then syphon off. This operation should be repeated two or three times. Finally, filter the precipitated carbonate of copper through three or four thicknesses of cheesecloth to remove as much of the water as possible. This is then known as plastic carbonate of copper, and is ready for use. To produce a required amount of carbonate of copper from sulphate of copper, 2 pounds of sulphate of copper and 2¼ pounds of carbonate of soda will produce 1 pound of dry carbonate of copper.—C. H. P.

STRIPPING

Q.—Will you kindly answer through your columns the following: What is best method of stripping thick deposits of nickel and copper from hooks used for plating? How can carbonate of nickel be obtained from single and double sulphate of nickel?

A.—Carbonate of nickel can be obtained from the solution of single and double sulphate of nickel by simply adding carbonate of soda which will precipitate the nickel in the form of carbonate and the greenish plastic matter is then filtered and thoroughly washed until all trace of the sulphate of soda disappears. The wash water may be tested with a dilute solution of chloride of barium so long as the reagent produces a white cloud in the wash water there is still some sulphate present and the washing must be continued until it is clear. The wash carbonate of nickel may be used in a moist state or it may be dried as desired.

For stripping your frames prepare a solution of nitric acid in water about 3 to 5 degs. Be. in an earthenware acid pot or in a small lead lined tank or any other suitable receptacle. Arrange the bath the same as a plating tank with three rods, but use reversed current. Support your frame for stripping on the middle or positive pole, to the outside or negative poles connect sheets of aluminum, use a strong current. The nickel and silver should then be rapidly removed and may be recovered from the solution.—C. H. P.

INDUSTRIAL

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST TO THE READERS OF THE METAL INDUSTRY.

THE INTERNALLY FIRED HELICAL FURNACE.

IMPORTATION OF UNIFORM HEATING.

Uniformity of heating of material in manufacture, if heating at all is necessary, is probably the most important operation to which the material is subjected, and has more influence to make or lose money for the manufacturer than any other. In fact the success of most of the other operations largely depends on the success of this one. The good or ill effects of annealing or hardening extend to all future operations upon the metal, and to the very life of the material itself.

ILLUSTRATIONS.

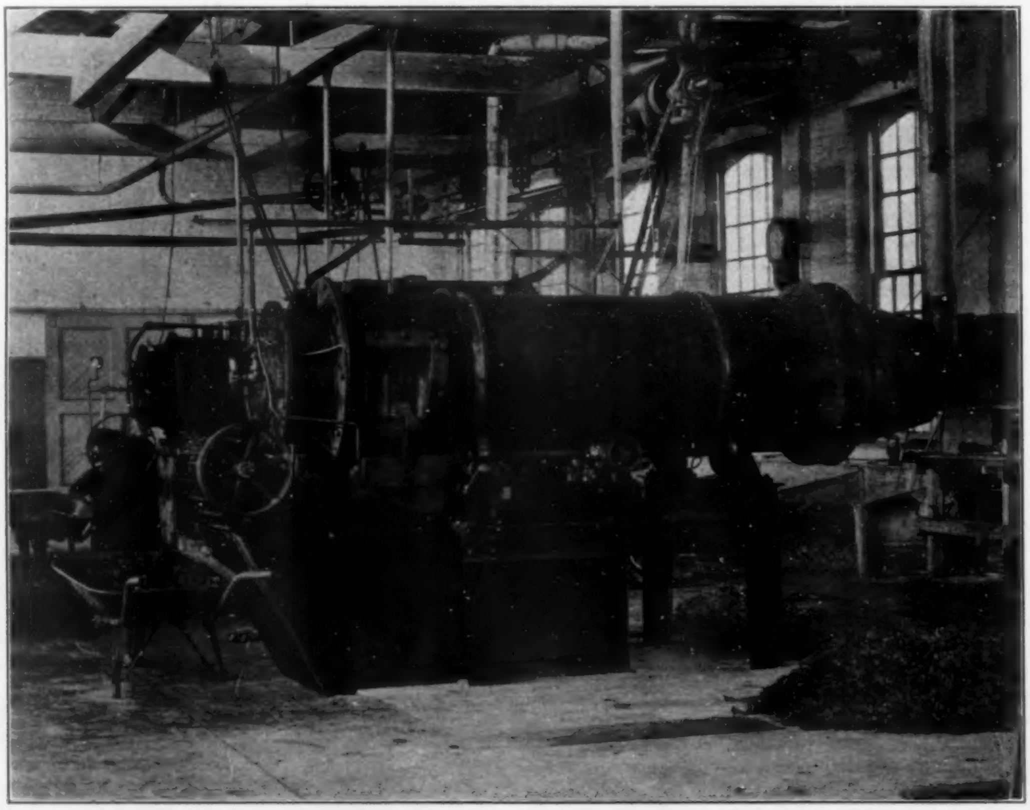
If the pieces are brass, for instance, and must be punched, drawn or spun, the machine which handles them will run much easier, smoother and faster without risk, if they are clean and uniform in malleability. If they must be stamped or pressed, they will appear clear and distinct and few or none will be "scrapped." If they must be buffed or polished they will work easier and be of one color when finished. If the pieces are steel and must be hardened, they will be as hard as that particular steel will admit of, and will be free from scale, easy to temper or polish if necessary, and will be strong and durable.

OBJECTIONS TO EARLIER METHODS.

Much annealing and hardening is still done in old style stationary furnaces, and owing to the size and shape of much of the material it must continue in that way, whatever the inconvenience and expense. Where size and shape have permitted some work has been and is being done in rotating cylinders heated from the exterior. Such cylinders are generally made of cast iron, and it is obvious that the life of the iron is too short to be satisfactory for many purposes, especially for the heating of steel. It is also obvious that the cylinder cannot conduct the heat to the material as economically as a direct application. Tumbling barrel furnaces and bucket and chain conveyor furnaces have been used for certain low-temperature work, each kind having its limits as to durability and efficiency, and each suggesting at once a protest against earlier and cruder methods as well as a hope for better ones to follow.

KIND AND AMOUNT.

In this country alone there are thousands and millions of small equal size bits of valuable material in brass, copper, steel, aluminum, gold, silver and other metal which must be annealed or hardened every day such as cartridge shells, ferrules, eyelets, buttons, caps, cups, coin blanks, steel balls, saw teeth, tacks, screws, rivets, rings, springs, nuts, punchings, etc., and it was only natural that the internally fired helical furnace here described and illustrated should have been designed to heat these pieces in a practically ideal and wholesale fashion.



THE INTERNALLY FIRED ANNEALING FURNACE.

DESCRIPTION.

As will be readily understood from the illustrations the furnace is formed of a steel cylinder, with a smooth fire tile lining of helical form and is rotated upon rollers supported by a suitable iron frame. The power may be furnished from a line shaft or from a motor suitably controlled. Ordinarily the speed is from one to three revolutions per minute and the time of travel through the furnace from 3 to 10 minutes. Either oil or gas may be used as fuel and it is injected directly into the chamber in the opposite direction to that of the travel of the material. Combustion is complete, and the spent gases find vent where the material enters, giving up their heat to the incoming material as they pass, in the spirit of true economy. For not only is the heat thus saved, but the material is thereby heated up in that gradual manner which is best for it. The material is charged into the feed-drum in bulk and is then wormed through the

furnace at a perfectly uniform and positive speed. The time and temperature for every piece is absolute. Starting cold the material winds its way through the convolutions of the furnace for a distance of about 47 feet, ever tumbling over itself, ever on a new hot surface, ever in the direct heat, yet only reaching its ultimate heat at the very point of discharge, where a pyrometer is so located as to show exactly what that ultimate heat is. Such heating is ideal, especially for hardening steel which should enter the bath at its rising hardening temperature. This action is important, also, in preventing or reducing oxidation.

A RECORD RUN.

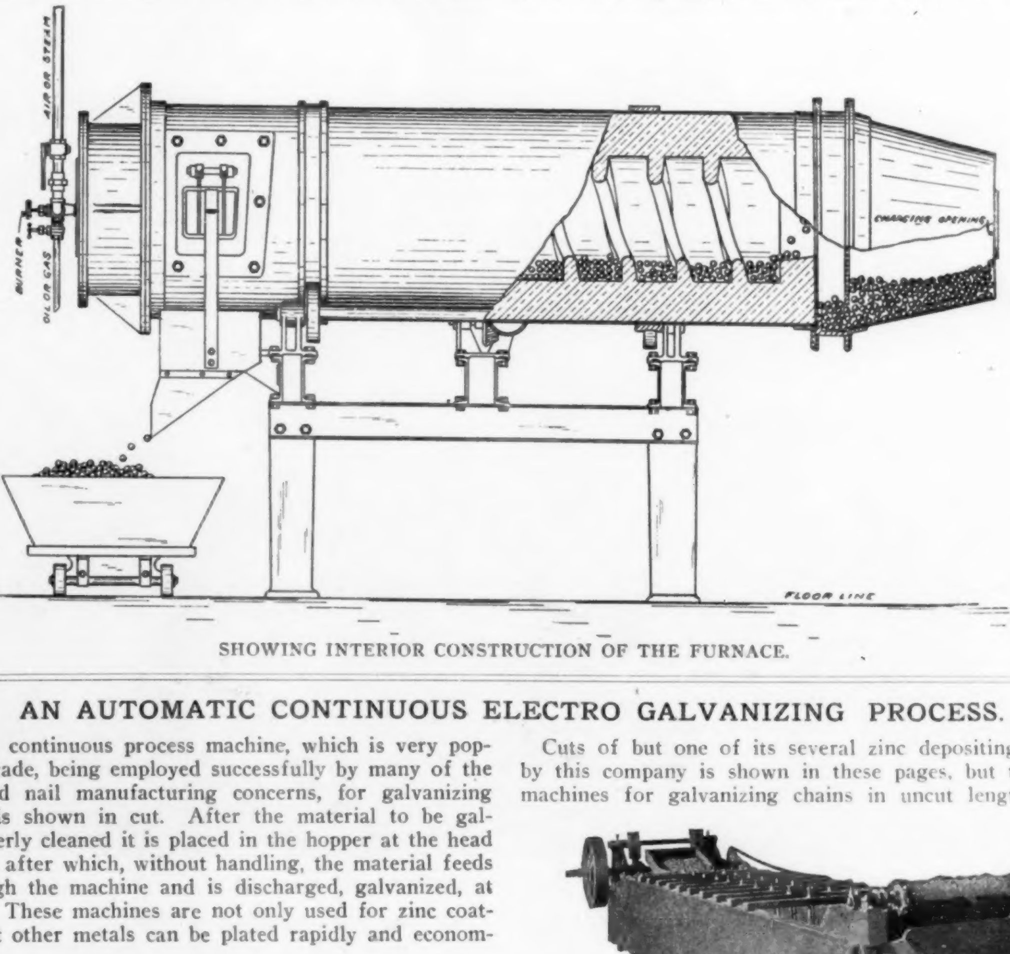
Each piece is exactly right and the day's output is all the same. For example, a lot of 15,732 pieces of steel was run through the furnace here shown and hardened in oil and each piece was then carefully tested. Only two were found imperfect, and they from flaws in the steel itself, not from the heat. The manufacturer stated that such runs were the rule, not the exception. Again, material annealed in this type of furnace in 6½ minutes was found to be cleaner and better in every way than the same material annealed for 45 minutes in a tumbling barrel type of furnace. This would seem to prove that protection from oxidation and saving of time are both effected when the material is heated up gradually, never overheated, and discharged the moment it has reached its ultimate temperature.

FOR HARDENING.

When the furnace was used for hardening a quenching tank with a conveyor was provided below the discharge spout so that the material after immersion was automatically removed from the bath quite clean and delivered into a truck or wheelbarrow. Provision was made so that two kinds of material could not become mixed; nor could any lodge in any part of the furnace or bath. By the simple removal of two bolts the conveyor could be easily removed from the bath, giving free access to every part thereof for cleaning or other purpose.

The furnace requires no chimney. A hood to carry off fumes from the oil bath or from machine oil on the material is sometimes desirable. Either air or dry steam may be used to inject the oil or gas fuel. Coal or coke fuel cannot be used. Practically all the iron work is out of range of the fire, and in this respect makes it very much superior to the early form, which was externally fired. This latter form of furnace was described in THE METAL INDUSTRY, November, 1906.

The internally fired helical furnace is manufactured by W. S. Rockwell Company, 50 Church street, New York.



SHOWING INTERIOR CONSTRUCTION OF THE FURNACE.

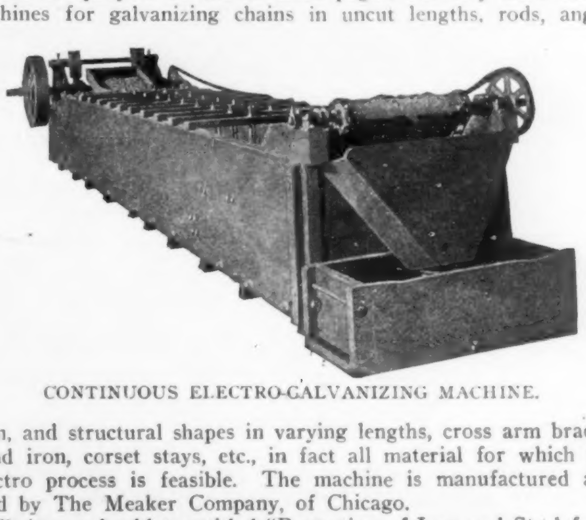
AN AUTOMATIC CONTINUOUS ELECTRO GALVANIZING PROCESS.

An automatic continuous process machine, which is very popular with the trade, being employed successfully by many of the largest bolt and nail manufacturing concerns, for galvanizing their product, is shown in cut. After the material to be galvanized is properly cleaned it is placed in the hopper at the head of the machine, after which, without handling, the material feeds into and through the machine and is discharged, galvanized, at the other end. These machines are not only used for zinc coating articles, but other metals can be plated rapidly and economically in them.

The electrolyte, or galvanizing solution, manufactured by the same company, is guaranteed to be self-sustaining, thus doing away entirely with the additions of salts and other mysterious chemicals. The solution is in density just below the crystallizing point and the metal or zinc contents is therefore the highest obtainable; and the solution, whether used daily or occasionally, continues to be dense and high in specific gravity. The most important factor in electroplating is the conductivity of the electrolyte, and in still plating the solution, working under ordinary conditions, deposits a smooth, ductile, non-porous coating of zinc at a current density of 75 amperes per square foot of surface with a pressure of 4 volts.

As all metal depositing solutions plate more rapidly when the cathode is moving, we assume that the claims made by the company that they deposit zinc at a current density of 125 amperes per square foot is truthfully made.

Cuts of but one of its several zinc depositing machines sold by this company is shown in these pages, but they have other machines for galvanizing chains in uncut lengths, rods, angle



CONTINUOUS ELECTRO-GALVANIZING MACHINE.

iron, and structural shapes in varying lengths, cross arm braces, band iron, corset stays, etc., in fact all material for which the electro process is feasible. The machine is manufactured and sold by The Meaker Company, of Chicago.

Their new booklet, entitled "Protection of Iron and Steel from Corrosion," will be mailed free on request.

UP-TO-DATE PLANT FOR THE MANUFACTURE OF SHEET METAL WORKING MACHINERY.

On a recent visit to the plant of the Ferracute Machine Company, of Bridgeton, N. J., the writer was impressed with the completeness of the works and the facilities for turning out presses and dies for manufacture of tinware, implements and other articles made of sheet or bar metal. The entire plant was wiped out by fire about four years ago and consequently the buildings and machinery are all new and of modern design. The site is attractive, being near a small lake adjacent to the tracks of the West Jersey and Seashore branch of the Pennsylvania Railroad, a spur of the railroad entering the works. If any one feature were to be separated from the others, probably the most interesting to the average visitor would be the driving of tools. No line shafts are used and every tool is individually driven by an electric motor, the current being supplied by two 75 k.w. General Electric direct current dynamos connected to two 100 h.p. Curtis steam turbines. We were informed the turbine engines, even when operating non-condensing, are side bays. Each side bay is served by a 5-ton Niles electric traveling crane and the middle bay by one 20-ton Niles electric crane, a 10-ton Pawling & Harnischfager electric crane and a 6-ton hand crane. The castings from the foundry arrive at the east end of the shop and after cleaning are progressively handled toward the west or erecting end where the spur from the Pennsylvania Railroad enters the building.

The machine tools are similar to those found in the better class of machine shops, except that they are driven by electric motors, dispensing with all overhead shafting and belting. An indirect steam-heating system is installed, the results being satisfactory even in extreme weather. The lighting is a prominent feature, there being a skylight on the northern slope of the roof 38 feet wide and running the entire length of the shop. On the opposite side of the ridge the skylight is extended downward about 8 feet. Windows along the sides of the building afford additional illumination for the side bays.

MACHINE SHOP OF THE FERRACUTE MACHINE COMPANY.

more economical in the use of steam than the reciprocating engine of the same power formerly used.

The pattern shop contains the usual quota of wood-working machines and each is driven by a motor. This allows any machine to be used without running any other and eliminates all overhead belts so that the room is unusually light. The lighting is further improved by painting all the machines a light color. Even in the forge shop, overhead encumbrances which would obstruct light, have been avoided. This building contains a number of Buffalo forges of the down draft type with underground connections from a blower for the blast and an induced draft fan withdrawing the smoke, a tempering furnace, two annealing furnaces, a Bell steam hammer and a five-ton traveling crane.

The machine shop is 200 ft. long and 100 ft. wide, the side walls being brick and the roof burned tile and wire-protected glass on a steel frame. Two rows of columns set 25 feet from the side walls divide the shop into a large middle bay and two

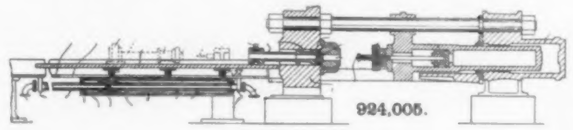
The plant has four telephones connected with the public telephone service and in addition an independent system of their own communicating with all of the departments and having 16 stations. The appointments for the comfort of the employees are complete, each having his own locker and there being an assembly room with papers and magazines for use when off duty. The wash room is large and well furnished, each man having a jet of warm water in addition to the water common to all in the steel trough beneath.

There was little indication of dull times in evidence when our representative made his inspection, a number of presses being under construction. An interesting machine was a massive coining press which, with a huge set of rolls, was about ready for shipment to Japan. A description of the press was published in THE METAL INDUSTRY for January, 1909. Numerous machines for notching armature disks and presses for punching and forming sheet metal were being constructed. The illustration gives a fair idea of the interior of the machine shop.

PATENTS

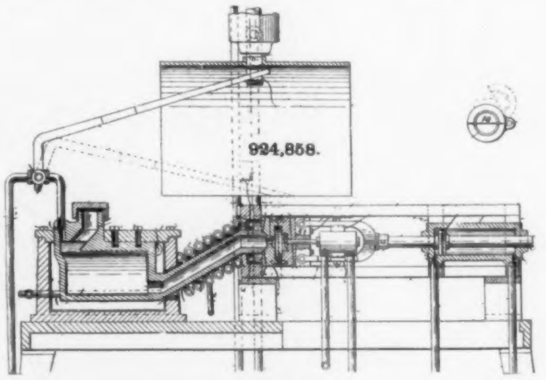
REVIEW OF CURRENT PATENTS OF INTEREST TO THE READERS OF THE METAL INDUSTRY.

924,005. June 8, 1909. PRESS FOR THE MANUFACTURE OF TUBES, RODS, ETC., FROM BLANKS. Arnold Schwieger, Berlin, Germany. As shown in cut this inventor has effected a combination with the press cylinder terminating in a matrix, of a plunger terminating in a perforated press disk and adapted to operate in the press cylinder, and a matrix projecting through the plunger and


924,005.

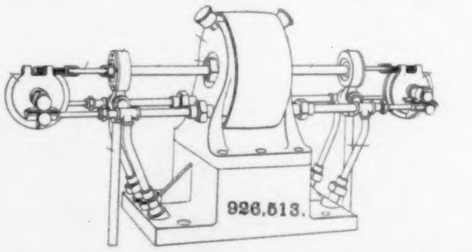
the disk in spaced relation to the wall of the perforation in the disk. The mandrel is mounted to move in the plunger and is of gradually increasing diameter from the front to the rear to allow of the slipping off of the material during the press operation. This improved form of press can be used for a greater variety of work and with less expenditure of power and less wear than those hitherto in use. The press is operated by hydraulic power.

924,858. June 15, 1909. CASTING APPARATUS. Elbert B. Van Wagner, Syracuse, New York. As shown in cut this invention consists of a casting apparatus for the production of die moulded castings, such as are used in meters, gauges and small castings of similar nature. The machine consists of a firebox containing a melting pot mounted on a table. There is a fluid pressure inlet


924,858.

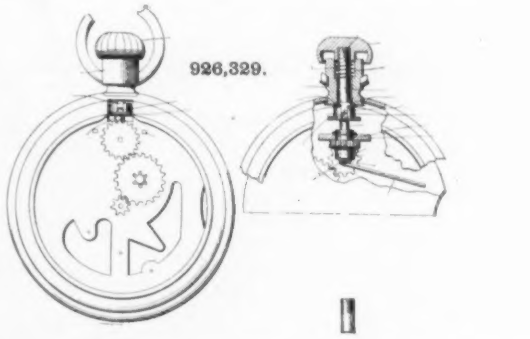
for admitting to and exhausting pressure from the melting pot. A horizontal frame also mounted on the table supports a pair of die sections having a mold formed in their abutting sides. A fluid pressure cylinder operates the die sections, causing them to open and close as desired and holds them shut while the operation of casting is going on.

926,513. June 29, 1909. ENDURANCE-TESTING MACHINE. Henry Souther, Hartford, Conn. As shown in cut, this is a machine designed to provide means for subjecting pieces of metal to endurance tests. The machine is efficient and reliable in its


926,513.

operation, and it gives the tests in duplicate. In view of the fact that an endurance test, to be absolutely accurate should be kept going without cessation from start to finish, that is to say, from start to rupture of the specimen, it is an important object of the present invention to provide a machine which will effectually answer this requirement, and, therefore, means have been provided for automatically registering the number of rotations of the specimen up to the time of rupture, whereby the machine may be run continuously both day and night without requiring the presence of an attendant to note the time of rupture of the specimen.

926,329. June 29, 1909. WATCH. Ernest H. Horn, Waterbury, Conn. Assignor to the Waterbury Clock Company, Waterbury, Conn. A new method of making a watch which consists in an improvement in stem-winding and stem-setting watches. The object being to reduce the number of parts to a minimum, and to secure the same smoothness and quietness for the wind-


926,329.

ing and setting functions of a cheap watch as for those of a high-grade watch. By making the crown stem in one piece, as shown in cut, the number of parts and operations are reduced and a simpler and more reliable device is secured. Also by loosely mounting the ratchet upon the winding-and-setting stem the ratchet is made self-accomodating, whereby noise and wear are reduced.

926,980. July 6, 1909. PROCESS OF MAKING ALLOYS. John T. H. Dempster, Schenectady, New York. Assignor to General Electric Company, New York. This patent covers a process for making an acid-proof and high-resistance coil, adapted for electric heating and rheostat work. The most successful composition is as follows:

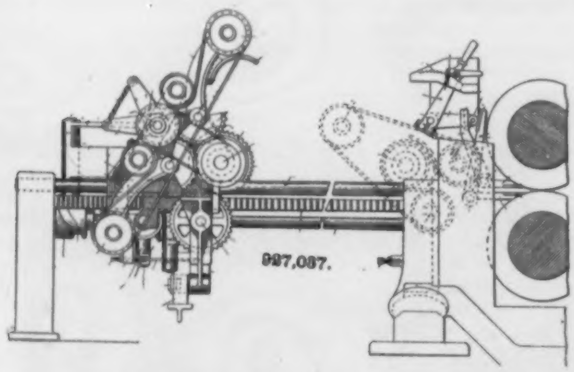
62 parts nickel	(by weight)
20 parts iron	"
13 parts chromium	"
5 parts manganese	"

In the melting of this alloy it was found that carbon must be excluded from the mixture since otherwise the alloy became hard and brittle. It was found, moreover, that nickel is high in carbon and that it is therefore necessary to purify the nickel in making up the alloy. Graphite crucibles cannot be used because of the fact that the metals of the alloy will take up carbon. Clay-lined crucibles serve the purpose, excepting for the fact that the manganese attacks the clay and exposes the graphite. The following process has been found to operate satisfactorily. In the bottom of a clay-lined graphite crucible is placed an oxide to serve of a decarbonizer. This oxide may be hematite (Fe_2O_3). It is found that about eight pounds of this oxide is necessary for one hundred pounds of alloy. Nickel is then charged into the crucible, with a small quantity of silica and cryolite as flux, and when the nickel is melted the heat is run up to promote a vigorous reaction between the oxide and the carbon. This reaction is shown by the gas bubbles igniting above the slag and burning with a blue flame. When the metal quiets down, the carbon being eliminated, the iron is added and after this is melted the chromium is added. While the mixture

is in a molten condition, care being taken not to excessively heat the metal and burn the lining, the manganese is added in suitable quantities. The mixture is then quickly poured before the manganese attacks the clay lining.

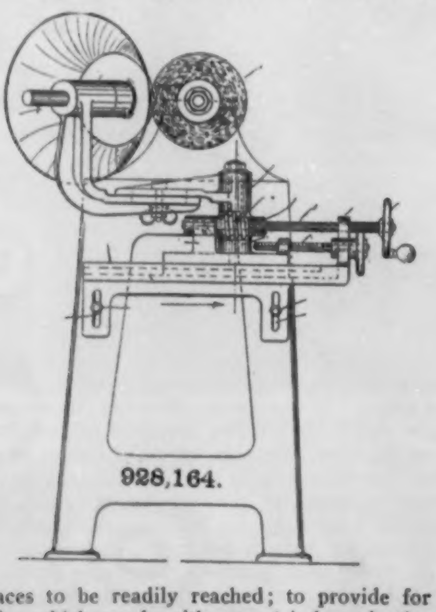
927,037. July 6, 1909. MACHINE FOR COILING METAL. E. O. Goss, Waterbury, Conn. Assigned to Scovill Manufacturing Company, Waterbury, Conn.

The object of this machine shown in cut is to provide an attachment for a rolling-mill for rolling sheet metal, whereby the sheet may be taken directly from the rolling-mill and automatically coiled or blocked into suitable coils or rolls. The chief



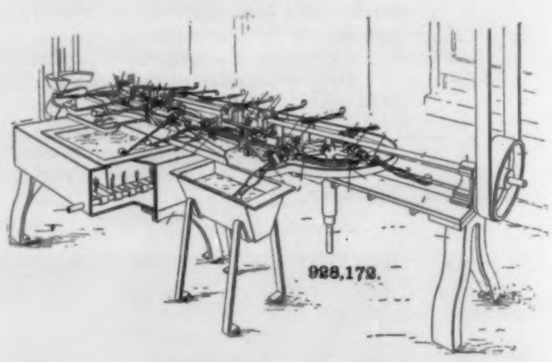
feature of the invention is a mechanism for stripping the metal from the rolls and guiding it thence to a blocking or coiling device mounted on a carriage which is capable of being moved forward and from the stripping mechanism. The coil of metal is lapped directly on the winding drum of the coiler and then coiled up without any handling by the operator. After being coiled it is automatically released and can then be readily removed from the drum.

928,164. July 13, 1909. BUFFING MACHINE. Percy B. Taylor, Newark, New Jersey. Assignor to the Tea Tray Company, of Newark, New Jersey. The objects of this invention, a cut of which is being shown, are to facilitate the buffing of bells for amplifying horns, and particularly to enable both the outer and



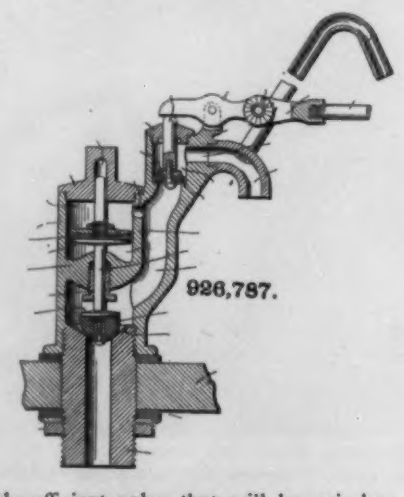
inner surfaces to be readily reached; to provide for this purpose a device which can be either used independently or applied to any regular type of buffing stand; to secure freedom of adjustment, and to obtain other advantages and results. While this machine has been designed particularly for work upon the bells of amplifying horns, it is obvious that the same might be employed upon other articles.

928,172. July 13, 1909. RETINNING MACHINE. Alfred L. Bernaidin, Evansville, Indiana. A machine, see cut, for retinning shells, bottle or jar closure caps and other metallic articles of manufacture, after they have been stamped up or otherwise formed, whereby to give such articles a luster or polish similar to a highly nickeled finish, and the said invention, in its generic nature comprehends a means for sustaining the articles to be finished, automatically conveying them to and immersing them in the coating solution, freeing them from excess coating, drying the said coating and then discharging the said articles, means being also provided for effecting the several operations stated successively and uninterruptedly.



The machine also has an endless conveyor, a series of article-holding members, upon which the articles are loosely mounted as the carriers are conveyed toward the fluxing and soldering baths, automatic means for causing the carriers to firmly grip the articles before they are immersed in the fluxing and soldering baths and another automatic means for releasing the grip of said carriers on the articles after they have been coated, whereby to permit of the ready removal of the coated articles from the carriers.

926,787. July 6, 1909. HIGH PRESSURE REDUCING AND NOISELESS VALVE FOR FLUSH TANKS. Alpheus G. Virkler, Lowville, New York. This invention consists of a new improvement in high pressure reducing valves, the principal object being to pro-



duce a highly efficient valve that will be noiseless in operation and simple in construction. The device as shown in cut dispenses with springs which are commonly employed for seating valves.

926,170. June 29, 1909. METAL HEADING MACHINE. Andrew C. Campbell, Waterbury, Conn. Assignor to E. J. Manville Machine Company, Waterbury, Conn.

926,736. July 6, 1909. MULTIPLE SPINDLE LATHE. John J. Grant, Cleveland, Ohio. Assignor to the Grant Automatic Machine Company, Cleveland, Ohio.

926,740. July 6, 1909. TYPE-CASTING MACHINE. Henry H. Hardinge, Chicago, Illinois. Assignor to Wiebking Hardinge & Company, Chicago, Illinois.

Associations and Societies

REPORTS OF THE PROCEEDINGS OF THE METAL TRADES ORGANIZATIONS.

NATIONAL ELECTROPLATERS' ASSOCIATION OF THE UNITED STATES AND CANADA.

President, Chas. H. Proctor, Arlington, N. J.; Treasurer, Nathan E. Emery, New York, N. Y.; Secretary, Benj. W. Gilchrist, Woodhaven, N. Y. All correspondence should be addressed to the Secretary, Benj. W. Gilchrist, Box 26, Woodhaven, N. Y. The objects of the association are to promote the dissemination of knowledge concerning the art of electro-deposition of metals in all its branches. Meets the first Friday of each month, 8 p. m., at the Hotel Chelsea, 222 West Twenty-third street, New York City.

The fifth regular meeting was held July 16, 1909, at the Hotel Chelsea, with nineteen members present. A number of applications for membership were received. Wm. F. Keefe, of Newark, N. J., was elected as an active, and Frank Eames, of Gananoque, Ontario, as an associate member. A design for the national emblem was submitted by J. J. Nicholl, of Newark, N. J., and was unanimously adopted as official. A number of these designs incorporated on a sterling silver button were ordered to be manufactured for distribution among members. The design, as herewith reproduced, shows a representation of a scale of a volt or ammeter symbolizing the trade, while the idea of the national scope of the society is carried out by the reproduction of the National Capitol. The topic of discussion for the evening was SPOTTING OUT OF PLATED ARTICLES, on which papers were read by Messrs. Fannon, Barnard, and Mallard. A general discussion on the subject followed the reading. We publish the papers in another part of this issue. The matter of the August meeting was taken up, and it was finally decided to hold it at Seaside, Rockaway Beach, Saturday, August 7, at 4 p. m. The meeting was followed by a dinner served at the Seaside Hotel. The subject for discussion at the September meeting will be THE ELECTRO-DEPOSITION OF ZINC.

OFFICIAL BADGE.

NATIONAL ASSOCIATION OF BRASS MANUFACTURERS.

President, Joseph H. Glauber, Cleveland, Ohio; Commissioner, William M. Webster, Chicago, Ill. All correspondence should be addressed to the Commissioner, William M. Webster, 1110 Schiller Theatre Building, Chicago, Ill. The objects of the Association are to promote in all lawful ways the interests of firms engaged in the manufacture of brass goods. Meets every three months. Each meeting fixes the place and date of the meeting to follow, consequently there is no stated place. It has been customary for the Association to hold its Annual Meeting in New York City, but the last meeting was held in Philadelphia. The Semi-Annual Meeting is generally held at Atlantic City or some other seacoast town.

This association will hold its next quarterly meeting in Detroit, Mich., August 24 and 25, 1909.

PERSONALS

ITEMS OF INTEREST TO THE INDIVIDUAL.

J. F. Hubbs has recently taken charge as foreman plater of the finishing department of the Morreau Gas Fixture Company, Cleveland, Ohio.

Joseph Stelker, of 142a West Pine street, Atlanta, Ga., is starting a metal department for the manufacture of pencil fittings at his electroplating factory.

J. A. Stremel has become associated with Charles H. Proctor, 621 Chestnut street, Arlington, N. J., in expert and consulting work, on plating and polishing.

Charles Zimmerman, foundry-foreman for the Sunshade Manufacturing Company, of Troy, Ohio, is having great success in turning out difficult castings. This company, encouraged by the general business outlook, are planning to enlarge their foundry this fall.

Charles M. Hall, vice-president and general manager of The Aluminum Company of America, returned from England on the Lusitania July 23. Mr. Hall is now recovering very rapidly from his recent illness. He is at present recuperating at Lake Placid Club in the Adirondacks.

Mr. John H. Lawrence, with the engineering department of the Vanderbilt University, Nashville, Tenn., and who is instructor there in foundry, machine and forge practice, has recently visited New York and a number of the northern cities to look into brass foundry practice.

Charles O. Lambert, who has been employed for the past twelve years as factory superintendent by the Jennings Brothers Manufacturing Company, Bridgeport, Conn., manufacturers of silverware, clocks, candelabra, art goods, etc., on August 1 assumed the duties of manager of the Art Metal Novelty Company, Meriden, Conn., who make a similar line.

Edward O. Goss, assistant treasurer of the Scovill Manufacturing Company, Waterbury, Conn., has decided not to accept the position of vice-president of the American Brass Founders' Association, to which he was elected at the recent Cincinnati Convention, representing the States of Connecticut, Maine, New Hampshire, Vermont, Massachusetts and Rhode Island (rolling mills).

Jerome Orcutt, who has been elected second vice-president of the Union Metallic Cartridge Company, Bridgeport, Connecticut, has been connected with the concern for 43 years. He has been superintendent and manager for a good many years. His assistant for the past two years, Harry H. Pinny, will have the active management of the plant, and will be in charge of all details of manufacturing.

Owing to ill-health Charles J. Caley, general manager of the Russell & Erwin Manufacturing Company, New Britain, Conn., has resigned his position. Mr. Caley will continue to act as a director and as soon as his health will permit will assume some advisory position. Mr. Caley has been spending the last two months in the Maine woods, but has left there to go to Norwich, Conn. He is well known in metal circles throughout the United States and abroad, having been president of the

American Brass Founders' Association and otherwise connected prominently with industrial societies.

Dr. Richard Moldenke, secretary of the American Foundrymen's Association, will leave about the middle of August for Sweden and Norway, and will also attend the Congress of the International Society for Testing Materials, at Copenhagen, Denmark, where he will present a report on the present status of testing cast iron. From Copenhagen Doctor Moldenke goes to Germany to visit relatives and then through the coal districts of Germany, Belgium, France and Italy, which trip is for rest and recreation, and also in connection with some professional work he is doing relating to coke. The Doctor will be abroad until the middle of October.

BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS IN THE DIFFERENT INDUSTRIAL CENTERS OF THE WORLD.

WATERBURY, CONN.

AUGUST 2.

Everything is calm here, and the general feeling is that at the end of the vacation period there will be a steady and rapid increase in orders which will probably have the effect of keeping the various metal factories running full time far into next summer.

As an indication of the expectations of the local manufacturers for a rush of fall and winter business it is pointed out that all have been buying heavily in the copper market and are now receiving shipments. Early this week nearly 400 cars were handled in the Waterbury freight yards, seventy-five per cent. of them for factories. Most of the incoming freight is raw material, which seems to have been ordered liberally. Twenty cars of copper were received here for two concerns, eight for the Randolph-Clowes Company and twelve for the Plume & Atwood Company.

Construction is going on steadily where work was begun in the spring and as space enlarges the various departments in the shops affected are shifting light machinery to be prepared for the emergency orders of the fall.

At the same time there is a noticeable general laxity in some of the branches producing small wares, such as eyelets, hooks, etc., where the panic conditions were hardly felt. The theory is that the consumption has been behind the production of such stock during the past eighteen months and that it will be but a short time when there will be a revival. The troubles in the shoe manufacturing business are thought to have had at least a slight effect on this feature of local production.

There is nothing unhealthy in the watch business of the Waterbury Clock Company and this concern has the record for early start on full time. In nearly all departments there has been need of full hands on full time since July 15 and while the vacation schedule has been but slightly affected the prospects are for plenty of work for many months. The progressiveness of the Ingersoll foreign selling campaign, which seems to have been successful in the face of financial troubles, is held partly accountable for this boom. The factory has been producing these watches almost to the limit of its capacity for several weeks in preparation for a big demand from the holiday trade next winter as well as to keep up stock in the selling centers.

The Scovill Manufacturing Company's plant is running on good time, some departments busy and others very slack. On the whole the conditions here are about normal. Already they are better than just before the panic.

Normal summer conditions exist in the plants of the American Brass Company. There is a noticeably larger amount of work on hand and a slightly larger payroll is being carried than a year ago. Prospects for a brisk fall business are good.

Business has improved considerably in the plant of the New England Watch Company. This concern has recently put out a new style movement for its cheaper watches. It has had little advertising and seems to have made slight impression on the market yet, but its sponsors have much faith in it. The fact that the old movement of the watches of this concern is practically the only one of its kind in modern watches is considered responsible in a large measure for the backwardness of business during the past two or three years and the radical improvements recently ordered in this direction are expected to solve the difficulty.

One of the rumors of the past week said that James S. Elton, of the American Brass Company, had bought a site for a fine new administration building for that concern. The rumor has not been verified as yet, due to Mr. Elton's absence from the city. The agent who made the transaction understands the purchase was a personal one and not for the company. At present the company's administration offices are in the Waterbury National bank building and that it should seek more commodious quarters is plausible.

The Chase concerns, the Waterbury Manufacturing Company and the Chase Rolling Mill Company, are busy five days a week and anxious to bring the vacation period to a close. In some of the departments of the rolling mill the six-day schedule could be put into effect were it not for the weather conditions and the desire of the company to give its employees a weekly holiday. There are orders enough on hand to keep the entire force busy in nearly all departments. Not in three years has the outlook for these concerns been brighter and a busy fall and winter are expected.

In the suburbs and up and down the Naugatuck Valley conditions are about normal. There have been some accidents in the older plants of the Coe Brass Company, the Torrington part of the American Brass Company, due to lack of repairs, but these have caused only trifling delays and the orders on hand have made it necessary to rush the repair work. There is no demand for labor, but plenty of work for all employed. In Ansonia the Brass company's plants are fairly busy with prospects of growing activity from the middle of this month throughout the fall.

Annual and semi-annual inventories have been practically completed and the resumption of work in the smaller plants has been noticeably easier than a year ago. This is taken as an indication of better financial conditions and good fall prospects.

There is little effect noticed here as regards tariff, but the manufacturing houses have all been watching the changes in schedules closely and while official statements are lacking pending the final passage of the bill there seems to be a general feeling of satisfaction concerning the rates affecting products of this section.—F. B. F.

PROVIDENCE, R. I.

AUGUST 4, 1909.

August 9 will see the end of the vacation season in practically all of the manufacturing jewelry establishments of this city and adjoining towns. This date will also mark the beginning of the new fall trade and it is confidently predicted that in nearly every plant the process of manufacture will start up with an impetus that will augur a remarkably fine season. There is a note of confidence in the air and few are the manufacturers who are saying anything about hard times today.

President Harry Cutler, of the New England Manufacturing Jewelers' and Silversmiths' Associations has just returned from an extended business trip through the West and he is enthusiastic over the condition in which he found trade conditions. He prophesies one of the best seasons which his plant has ever known. Representatives of other concerns who are in close touch with the field are equally sanguine over the prospects.

The executive committee of the Manufacturing Jewelers' Board of Trade recently had as their guests at a dinner at the Pomham Club in this city the following legal representatives of the asso-

ciation in various cities of the country, who happened to be in attendance at the recent national convention of the Commercial Law League of America at Narragansett Pier: A. N. Eastman and E. P. Eastman, Chicago; Samuel W. Cooper, Philadelphia; Willard P. Smith, San Francisco; E. J. Thilborger, New Orleans; Martin Clark, Buffalo; Edward H. Brink, Cincinnati; J. C. Burns, Cincinnati; John B. Edwards, St. Louis; Louis J. Grossman, Cleveland; Lewis B. Hall, Toledo; John C. Price, Columbus; C. E. Blanchard, Columbus; H. Winship Wheatley, Washington; and Fred L. Norton, Boston. The local men present were Fred A. Ballou, Fred D. Carr, Alfred K. Potter, Charles P. Keeler, Edward B. Hough, Everett L. Spencer, Robert E. Budlong, Harvey Huestis, Harry Wolcott, Marcus W. Morton, Horace M. Peck and E. L. Leavitt.

George A. Barrows, a veteran jeweler of Attleboro, died July 9 of heart failure. He had been in the jewelry business for over 51 years in Plainville, North Attleboro and Attleboro.

Ellis MacAllister has disposed of his interest in the firm of Tuck & MacAllister, manufacturing jewelers. The business will be continued under the same name by Alaric R. Tuck and Eugene Blakely.

Otto C. Lenz, for many years a prominent jewelry manufacturer of this city, died Saturday evening at his home, 150 Camp street. Death was caused by lung trouble. Mr. Lenz was born in Stuttgart, Germany, in 1837, and came to this country when 17 years old. Shortly after entering the manufacturing jewelry business he became a member of the firm of William Smith & Company. This firm did an extensive business and in addition to its plant here had an establishment in New York.

The Providence and Boston branches of the Metal Trades Association were the guests of the Worcester branch at the latter's annual outing at Edgemere, Lake Quinsigmond, a short time ago. The visitors were met with autos and taken to Edgemere where a shore dinner was served. After a programme of sports, the visitors were escorted on a tour of inspection of the Worcester shops and manufactures.

The recent effort of John Nelson, whose recent conviction in the Superior Court on a charge of receiving stolen goods has been closely followed by all the manufacturing jewelers of this section, to secure a new trial has met with failure, the court refusing to entertain his application. The case was of especial interest to the jewelers, as it involved the disposition of valuable metal alleged to have been stolen from jewelry factories.

Charles H. Horstmyer was recently arrested in this city while trying to dispose of a lot of jewelry scraps. He was recognized while in a pawn shop by two detectives who happened to saunter by as the man who, in 1906, was convicted in this city of stealing considerable gold scrap and manufactured goods from the S. & B. Lederer Company, by whom he was employed as foreman. When arraigned in court on the new counts Horstmyer pleaded guilty and was sentenced to three months in jail.

Lorenzo P. Sturtevant, doing business as D. R. Child & Company, at North Swansea, Mass., has made an assignment in favor of his creditors, to James G. Phetteplace. The business is one of the oldest manufacturing jewelry concerns in New England. It was established in 1862 by Daniel R. Child who conducted it for many years, doing a lucrative business in collar buttons and sleeve buttons. Tons of collar buttons were turned out each year, the output being equaled by few factories in this section. In 1893 Mr. Child sold out.

Mayor Henry Fletcher, of the Fletcher-Burrows Company, manufacturing jewelers, has returned from a vacation trip to Niagara Falls, Montreal and the White Mountains.

Hanlon & Thornton, manufacturing jewelers, who are now located in North Attleboro, have determined to remove to Woonsocket. Land has been purchased in the latter city at the corner of Diamond Hill road and Peter's street. The firm was granted exemption from taxation for 10 years by the Woonsocket City Council. Plans are now in preparation for the new structure. At a recent election of the stockholders John Daly, of Pawtucket, was made president, and Michael F. Hanlon, treasurer.

The tools, machinery and good will of the Rhode Island Novelty Company have been sold to M. Leary, manager and designer for the concern for some time, and William C. Penfold, formerly of the William C. Penfold Company, of New York. The name of the new concern will be Leary & Penfold and the offices are to be at 59 Page street. Mr. Leary will be in charge of the manufacturing end and Mr. Penfold will represent the company in the East.

The Mackenzie-Walton Company, manufacturers of seamless wiring and tubing, have taken possession of their new factory at 478 Pawtucket avenue, Pawtucket. They were formerly located on Westfield street, Providence. The new building is two stories in height, of brick, and is 130 feet long and 80 feet wide.—E. S. U.

BUFFALO, N. Y.

August 4, 1909.

The metal industry continued to show improvement last month and while conditions are still rather unsettled as in other businesses as a result of the tariff delays and the crop reports, they are slowly but surely returning to normal again. Two of the largest automobile manufacturers in the country located here are rushed with orders for cars and big shipments are being made to Western cities. The plating and aluminum end of the industry is enjoying a small boom and more polishers were employed in several of the shops last month. One of the automobile concerns is erecting a big addition. In both of them the forces are working full time.

The Allyne Brass Foundry which makes a large part of the aluminum castings and bronze parts for local automobile manufacturers is working its plant to capacity and reports that it has a sufficiency of orders on hand to keep running for several months.

The Lumen Bearing Company, which makes machinery parts, has opened an addition to its brass foundry on the New York Central Belt Line, which has 35 furnaces with a capacity of 30,000 pounds a day. This firm reports business still a bit sluggish, but the revival is gradually coming. Collections are reported better than in eighteen months and orders from many places are being received.

Other firms report purchases lighter than expected at this period with a noticeable indifference on the part of buyers in many of the Eastern manufacturing centers. Their salesmen report that concerns, for instance, that paid no attention to anything but the manufacturer of engines are branching off into little odds and ends. Supply houses are doing better than a month ago, for the reason that there is more local building. Also there is a noticeable call for copper ornamental work.

The Buffalo Brass & Copper Company, located on Military road, has increased its floor space about 30 per cent. by the addition of a new mill. This concern which rolls brass and copper sheet finds the outlook much more encouraging than two months ago. There is still, however, a hesitancy on the part of small customers to buy liberally.

The labor conditions here are serene. There is plenty of good help to be had and the molders and polishers are getting better wages than ever.

The Manufacturers Club has announced plans for another and more elaborate industrial exposition, to be held in October. The show will be held in the old Broadway arsenal, which has three times the space of Convention Hall where last year's show was held. A beautiful electrical display scheme is planned for the downtown streets leading to the fair. A score of local houses in the metal trades have made reservations for space and the show ought to be a surprise.

Manufacturing jewelers here are receiving encouraging reports from their salesmen on the outlook for the winter trade. They had a good ring business in June, but there has been no activity in the call for novelties.

The sheriff has hundreds of extra deputies on the watch for wire thieves who have been giving the telegraph and telephone companies all sorts of trouble by stealing spans and spans of wires from their poles in and out of the city.

William W. Oliver, president of the W. W. Oliver Manufacturing Company, manufacturers of jewelers' machinery, died suddenly at Atlantic City last month, where he had been for a few days' rest. Mr. Oliver came here from Worcester, Mass.—F. M. A.

DETROIT, MICH.

August 4, 1909.

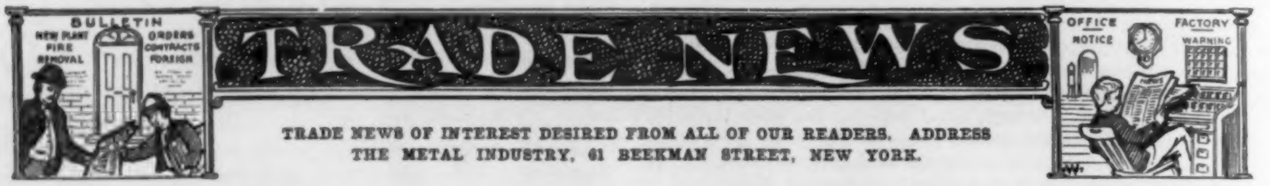
Another month of prosperity for the Detroit brass industry has rolled around and still manufacturers in this line report business on the increase. While other cities have struggled along during a period of depression, nothing of the sort in this line has been felt in Detroit. More men are employed in the brass industry here now than for many months. Increased orders are reported from the many plants and there seems no let up in business. The majority of Detroit brass plants are busy on automobile parts that for a long time have been in constant demand. Manufacturers are more than pleased with results during the past months and at this early period are preparing for a big run of business during the coming fall and winter.

Vice President Howard, of the Brass Founders' Supply Company, reports a big trade during the past few weeks. This firm has just equipped the Morrenci & Van Buren Brass Foundry Company's plant at Sturgis, Mich., a new concern that is just opening up an establishment to manufacture a general line of plumbers' supplies. This company is capitalized for one hundred thousand dollars and has installed one of the finest manufacturing plants in the United States. Mr. Howard says there is a growing demand for all kinds of brass supplies and that his plant is working to its capacity.

The Allyne Brass Foundry Company, of this city, is erecting one of the finest plants in the Middle West. The main building is 300 by 250 feet, and when completed the company will be in a position to handle an enormous line of business.

Superintendent Fezzy, of the Acme Brass Foundry Company, like all other brass manufacturers, declares the trade was never better in the history of his business. He also is manufacturing automobile brass supplies.

The jewelry industry continues about the same it has for the past two months. Every manufacturer in the city reports good business, and considers the prospects for next fall much better than they were a year ago.—F. J. H.



TRADE NEWS

TRADE NEWS OF INTEREST DESIRED FROM ALL OF OUR READERS. ADDRESS THE METAL INDUSTRY, 61 BEEKMAN STREET, NEW YORK.

The Milwaukee Aluminum Manufacturing Company is having plans prepared for a two-story brick brass foundry, 40 x 140 feet, at Reed and South Pierce streets.

The Duplex Metals Company, Chester, Penn., resumed operations July 23, 1909, after a shut down of several weeks. The erection of the new melting furnace has been completed and several improvements in process made.

The American Lead Company, Pittsburg, Penn., subsidiary to the Pittsburg White Metals Company, is building a one-story steel manufacturing building to cost $3,300 at No. 3116 Penn avenue. Lead wire, solder and pipe will be made here.

Current report has it that the Standard Brass and Copper Tube Company, of New London, Conn., will shortly begin operations. While the operating force will be small at first, the indications are that it will rapidly increase in size in the near future.

The Excelsior Brass Foundry and Pattern Works, Reading, Penn., report fair business. They say they notice a slight increase over the past six months. This firm does all kinds of refinishing and plating of metal goods, making a specialty of gold and silver.

The Miller Manufacturing Company, of 608 Eddy street, Providence, R. I., who are manufacturers of soaps for toilet, textile, and tannery purposes, are now making a special product for the metal trade, known as Kleanola Soap Powder, for removing Vienna lime, also a Fig Kleanser for cleaning metals and burnishing compounds.

The Phosphor-Bronze Smelting Company, 2200 Washington avenue, Philadelphia, Pa., has recently sent out notices that the Phosphor-Bronze Smelting Company, Limited, has been dissolved and that its property has been taken over by the Phosphor-Bronze Smelting Company, a corporation which has been organized under the laws of the State of Pennsylvania. The notice was signed by Theodore H. Luders, Thomas L. Luders, Jr., and Phillip E. Luders, the liquidating trustees. The officers of the Phosphor-Bronze Smelting Company are Thomas L. Luders, Jr., president, and Lewis B. Luders, secretary.

The Meaker Self-Sustaining Galvanizing Solution is the announcement of the Meaker Company, of Chicago. The company desires to prove this claim and will galvanize and return samples free of charge. If satisfactory they are ready to make an attractive offer. Their new booklet M. tells about this galvanizing process.

Contracts have been let for the construction of a foundry building for the Milwaukee Aluminum and Brass Foundry Company, at the northwest corner of Reed and South Pierce streets, Milwaukee, Wis., from plans by Architect Fred Graf. The building, 34 x 140 feet, will be two stories high, of solid brick, and will cost $8,000. It will be ready October 1. Construction work will begin at once.

The Homer Brass Works, Philadelphia, Pa., recently purchased the lot at the northeast corner of Water and Mifflin streets. The buildings which have been erected thereon were specially designed for the purposes of the company. This concern manufactures brass castings, etc., in the rough or machined for any purpose; also, anti-friction metals, babbitts and journal bearings and superior brass work for water, liquor, oil or steam.

The Benedict Manufacturing Company, of East Syracuse, N. Y., are putting on the market some attractive metal work known as "Karnak Brass." The metal work consists of a combination of finishes, the main portion of the articles being finished in brush brass, while the applied engraved ornaments are shown in Nile green. The yellow and green make harmonious coloring. A. F. Saunders, a designer with the Benedict Company, applied the two finishes in question to the manufacture of metal goods.

The Ellwood Ivins Tube Works, mills at Oak Lane Station, Philadelphia, report a very brisk trade in cold drawn seamless steel tubes of large diameters. They have several government orders for the Panama Canal among their contracts. They now draw seamless steel tubes as large as 4 inches in diameter, and are preparing to produce them up to 6 inches in both tool steel and low carbon steel. Their principal claim is extreme accuracy and smooth finish.

The Rockford Metal Specialty Company, Rockford, Ill., formerly Cable & Anderson, has worked up a nice business in specialties in all sorts of metal. One of its branches is electro galvanizing, nickle, copper and brass plating, japanning and tinning, all operations requiring special equipment and for which there is considerable demand. It makes a large line of hardware specialties and novelties which are contracted by owners of patents and are disposed of in many lines through the country.

The Buckeye Products Company, of Cincinnati, which recently

succeeded to the business of The Buckeye Manufacturing Company, of the same city, are having unqualified success in the marketing of their product, Buckeye parting compound. The improved form of compound, as now manufactured, has been received with special evidences of favor by the trade, and President Charles Goehringer reports that the prospects for foundry activity are excellent, as is evidenced by a larger and wider inquiry than at any time during the life of the new firm.

Proposals will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until 10 o'clock A. M. August 24, 1909, and publicly opened immediately thereafter, to furnish at the Navy Yard, Mare Island, Cal., a quantity of naval supplies, as follows: Sch. 1498: Brass wood screws; phosphor-bronze wire. Sch. 1499: Brass pipe, fire brick. Applications for proposals should designate the schedules desired by number. Blank proposals will be furnished upon application to the navy pay office, San Francisco, Cal., or to the Bureau. E. B. Rogers, Paymaster-General, U. S. N.

The Slade Tubing Company, formerly of Pawtucket, R. I., which has been incorporated at Rome, N. Y., under New York State laws, are fast completing their arrangements to move to Rome. They will occupy the building in East Dominick street, formerly the plant of the James A. Sporgo Wire Company. The Slade Company will engage in the manufacture of small sizes of seamless copper and brass tubing, which line has been manufactured at Pawtucket for some time. The purpose of moving to Rome is for increased facilities in doing business, and to be nearer the base of supplies. The Rome Brass and Copper Company have been furnishing the larger sizes of tubing from which the smaller are drawn for a number of years.

London mail advices say that it is generally believed that negotiations are proceeding for the reconstruction of the aluminum syndicate which came to an end last year, the chief constituents of which were the British Aluminum Company, the Neuhausen Works, and the Northern Aluminum Company of the United States. The syndicate was forced into dissolution by the springing up of a number of small producers, especially in France, who cut prices right and left. Now the French manufacturers have become dissatisfied with the open market which has been established, and, at a meeting held a few days ago, decided not to book any further business for 1909 and 1910 delivery at present prices. Under these circumstances it is thought probable that a fresh understanding of an international character will be brought about, with the result that prices will be advanced.

A novel display of electric furnaces for all classes of chemical work was recently exhibited in the testing rooms of the new plant of the Hoskins Manufacturing Company, Detroit. In the furnace room a permanent installation, with transformer and switchboard, of the Hoskins Type FC, carbon plate resistance furnace was shown. This furnace was in regular operation melting special alloys, it being capable of producing a temperature of 2000 degs. C. (3632 degs. F.) In connection with the furnaces a complete installation of Hoskins Thermo-Electric Pyrometers was shown. In each of the operating furnaces was placed a thermo-couple, all of these being connected through a Selective Switch to an illuminated dial meter calibrated in Fahrenheit degrees. By turning the switch the temperatures of each of the furnaces were indicated in quick succession upon the meter scale.

The International Acheson Graphite Company is enlarging the output capacity of its branch works in Niagara Falls, Ontario. This company has for many years operated a Canadian branch, with facilities far in excess of the demands of the Canadian trade. It, however, recognizes in the hydro-electro development now so active throughout the Dominion, and the new trade spirit and energy everywhere present throughout Canada, an indication of additional industrial enterprise, and it is to meet the prospective demand for its product likely to be created by the new conditions that it is increasing the size and output capacity of its plant in Niagara Falls, Ontario. A new furnace room providing for a 1,000 h.p. unit is being built, and on completion the new furnace installation will be placed in operation. It may be noted that all Acheson-Graphite is made in the electric furnace.

On September 25 the 300th anniversary of the discovery of the Hudson River by Henry Hudson, 1609, and the 100th anniversary of the successful application of steam to the navigation of the river by Robert Fulton, 1807, will be celebrated by the City of New York. The membership of the Hudson-Fulton Celebration Commission includes the mayors of all the 46 cities of the State and the presidents of 38 incorporated villages along the Hudson River.

The celebration will cover upward of two weeks. The first week will be devoted to various exercises, religious and secular, which will also include naval and military parades around New York City, winding up on October 2 with a grand carnival.

The second week of the celebration will begin on October 3 and will be devoted to celebrations in the communities along the Upper Hudson. This will be somewhat in the nature of an Old Home Week.

REMOVALS

The Dow Chemical Company, Chicago, Illinois, have moved from the American Trust Building to 104 South Clinton street.

The Hartman Aluminum Solder Company, formerly at 426 West 52d street, have removed to 134 West 49th street, where they have much better facilities for carrying on the business of repairing automobile parts and the manufacture of the Hartman aluminum solder.

August Grifford, of Newark, New Jersey, founder of light and heavy castings of brass, bronze, gold, silver, etc., has sent out notices that he is now in his new foundry, 282-286 Chestnut street. He is much better equipped for turning out both small and large castings than in the past.

INCORPORATIONS

Business organizations incorporated recently. In addressing them it is advisable to include also the names of the incorporators and their residence. Particulars of additional incorporations may frequently be found in the "Correspondence" columns.

Acme Jewelry Company, Boston, Mass. Manufacture and sale of jewelry. Capital $25,000. President, C. N. Thomas; treasurer, G. O. Skoog, of Malden, Mass.

The Grand Rapids Brass Company, Grand Rapids, Mich., have filed notice of increase in its capitalization from $200,000 to $250,000. The purpose is to care for the growth of the business.

Empire Globe Company, Jersey City, N. J. To deal in tin, copper, brass, glass and glass ware. Capital, $20,000. Incorporators: John J. Treacy, Charles C. Clinton and John A. Moran, all of Jersey City.

Etna Brass and Bronze Works, Brooklyn, New York. To deal in articles of brass, bronze, copper, etc. Capital $200,000. Directors: Henry F. Hoffman, Jefferson Morand and Johanna Hoffman, all of Brooklyn.

Tempered Gold and Silver Corporation, Augusta, Maine. To manufacture and deal in articles of gold and silver. Capital, $100,000. Incorporators: President R. S. Buzzell, Treasurer S. W. Pike, both of Augusta.

The Foster Machine Company has been incorporated at Elkhart, Ind., with $25,000 capital stock, to do a general machine manufacturing business. The directors are W. Harry Foster, E. B. Zeigler and Marion E. Brady.

Murray Brass and Foundry Company, of New Britain, Conn. To manufacture brass castings, etc. Capital $2,400. Incorporators: Thomas and William F. Murray, of East Hartford, and Joseph Abetz, of New Britain, Conn.

The Pouso Alto Diamond Company, New York, N. Y.; to deal in diamonds and jewelry. Capital, $1,000,000. Directors: George McElmell, George Karnold, Emile Rosir, Harry A. Brome, and A. Lee Bates, all of New York City.

BUSINESS TROUBLES

Martin J. Kavanaugh, coppersmith and president of the Baltimore Brass Works, Seventh and Gough streets, Highlandtown, made an assignment for the benefit of creditors July 16 to Garnet Y. Clark, his attorney. As trustee under the deed Mr. Clark bonded for $30,000. Mr. Clark said that Mr. Kavanaugh is only temporarily embarrassed, and that he decided to make the assignment for the protection of his property, as suits have been brought against him on promissory notes aggregating $6,000. Mr. Kavanaugh's liabilities do not exceed $10,000, Mr. Clark also said, while his assets are more than $30,000.

PRINTED MATTER

VOLTAMMETER. A leaflet on the subject has been issued by the Hoyt Electrical Instrument Works, Penacook, N. H.

S. OBERMAYER, Cincinnati, Ohio, has a lot to say about his rubber-tipped foundry runner in a four-page folder just published.

HOUSE ORGAN. The Plate for July contains articles by George L. Wallace and Herbert J. Hawkins, and other matter setting forth the apparatus, chemicals and supplies of the Dow Chemical Manufacturing Company, of Mansfield, Ohio.

METALLURGICAL CLAY GOODS, together with Case gasoline, muffle and crucible furnaces, muffle furnaces for coal, wood, coke and oil are the latest products of the Denver Fire Clay Company of Denver, Colo., told about in their Bulletins 21, 23 and 24.

WATER GLASS GUARD, manufactured by the American Steam Gauge & Valve Manufacturing Company, of Boston, Mass. This guard is known as the positive water glass guard and is fully described in a 4-page folder which shows the guard in use.

MUFFLE FURNACES, for assaying and other work, run by either oil or gas, are manufactured by the W. S. Rockwell Company, 50 Church street, New York City. These furnaces are described in a 4-page folder which gives full specifications and capacity with directions for their use.

PLUMBERS' BRASS GOODS. A neat, attractive catalog ("C"—1909) on the subject has been issued by the Frost Manufacturing Company, of Kenosha, Wis. There are 141 pages, including some blank memorandum pages in the rear. The booklet is fully illustrated and nicely printed.

HOISTING MACHINERY. The Parker Machine Company, engineers, designers and manufacturers of high grade hoisting machinery of Chicago, Ill., have issued a complete little catalogue of the various forms of hoisting and conveying machinery which they manufacture. They also include tables and price list of wire rope.

BUCKEYE FLUX, manufactured by the Buckeye Products Company, Cincinnati, Ohio, is claimed to be true economy when employed in the foundry for melting brass, bronze and copper. It will reduce the percentage of loss due to oxidation at least one-half. This flux is packed in 50-lb. trial boxes, 100 and 250-lb. barrels.

PRESSURE AND VACUUM RECORDING Gauges, bulletin No. 104, consisting of 40 pages, giving a description of the various gauges manufactured by the Bristol Company, of Waterbury, Conn., has been issued as a preliminary bulletin of their forthcoming catalogue. The bulletin is well gotten up and contains facsimile charts of their steam and air pressure recording gauges.

THE GARVIN MACHINE COMPANY, of Spring and Varick streets, New York, have issued their catalogue "Edition D," which is printed in English, French and German. This catalogue contains 100 pages, and illustrates and describes the complete line of profiling machines, milling and tapping machines; also gang-drill presses and duplex lathes, saws, etc. Owing to the fact of it being printed in several languages, it makes this catalogue very valuable for export purposes.

VEEDER CASTINGS.—Catalogue No. 15, which is being sent out by the Veeder Mfg. Company, Hartford, Conn., describes Veeder die castings ands explains the characteristics of the alloy from which these castings are made. Besides using these castings in their own counters, cyclometers, odometers, etc., they manufacture large quantities for manufacturers of coin-counting machines, cash registers, typewriters, etc.

CRUCIBLES. Some new folders relating to list of sizes and capacity of the pots manufactured by the Waterbury Crucible Company, Waterbury, Conn., has just been issued. The circular matter gives the outside measurements of the crucibles, viz.: Height, top, bilge, bottom, per number, also the liquid capacity, viz.: The number of gallons, quarts and pints that each size will hold. It is handy reference matter for crucible users.

HAND BOOK OF GASOLINE AUTOMOBILES, issued by the Association of Licensed Automobile Manufacturers, 7 East 42d street, New York, consists of 140 pages handsomely illustrated with photographs of all of the motor cars manufactured by the members of the association, and one page of the catalogue is devoted to each make, giving its price and specifications. This is a valuable book to any one interested in the manufacture and use of automobiles.

ADNEWS

Tuberculosis is the subject mentioned in the quarter page of the Metal Dross Economy Company, of Bristol, Conn.

Lacquers, all kinds, for all sorts of work, with gold lacquers a specialty, is advertised by the American Lacquer Company, of Bridgeport, Conn.

Zapon jet black lacquer is the subject this month of the Celluloid Zapon Company, 310 Fourth avenue, New York city, Metropolitan Building.

The Hoyt Electrical Instrument Company, Penacook, N. H., call attention on another page to their type 25 voltmeters, which they sell for $7.50 and which are guaranteed for one year. Their bulletin "I M" gives full particulars.

Hille and Müller, Dusseldorf, Germany, who are the largest manufacturers in the world of electroplated steel strips, are advertising their products in this issue. They furnish steel and zinc sheets in nickel, brass, copper or Tombac finish.

A perfect melting furnace is advertised by the Chicago Flexible Shaft Company, 165 Ontario street, Chicago, Ill. The furnace is described as durable in construction, economical in operation and always reliable. The company is glad to prove all claims and solicits correspondence.

The International Chemical Company, of Camden, N. J., who make a specialty of metal cleaners of all kinds, manufacture a number of platers' compounds which are particularly adapted for the removal of buffing composition. They solicit correspondence from firms who desire to obtain improved products. Their advertisement is on the back cover of this journal.

STANDARD COPPER

On August 2 the New York Metal Exchange inaugurated trading in Standard Copper on the daily call, and in future the Metal Exchange will only quote the prices for Standard Copper made on the daily call on bids and offers.

The movement so far has been very successful, and sales have been made each day of from 100 to 300 tons. The grade of Standard Copper deliverable on contracts is fully explained in Rule 4 of the Metal Exchange.

The minimum quantity dealt in is 25 tons of 2,240 pounds each

Copy of these rules in full follows. We shall be pleased to supply our readers with copies of these rules upon application.

RULE 1.

The kind of copper to be dealt in shall be Standard copper.

RULE 2.

The minimum quantity dealt in shall be 25 tons of 2240 pounds each.

RULE 3.—CALLS.

SEC. A.—All bids for and offers to sell shall be for about 25 tons of 2,240 pounds each, or the multiples thereof, and when quantity is not named, it shall be understood as about 25 tons of 2,240 pounds each.

SEC. B.—No offer to buy or sell shall be entertained at a less difference than two and one-half hundredths of a cent per pound.

RULE 4.—FORM OF CONTRACTS.

New York 190

In consideration of one (1) dollar in hand paid, the receipt of which is hereby acknowledged..................ha......this day sold to (or bought from)..................about......tons, of 2,240 pounds each, of Standard Copper, at...............cents per pound, deliverable at seller's option during....................190..

Sellers have the option to deliver each 25 tons, either in:

Class A.—Refined Copper assaying not less than 99 per cent., and below 99.30 per cent., at contract price.

Class B.—Refined Copper assaying not less than 99.30 per cent. and below 99.80 per cent., at ⅛ of one cent per pound over contract price.

Class C.—Refined Copper assaying not less than 99.80 per cent., at ¼ of one cent per pound over contract price.

Class D.—Rough Copper subject to a rebate of ⅛ of one cent per pound from contract price.

This contract is made in view of and in all respects subject to the By-Laws and Rules established by the New York Metal Exchange, in force at this date.

(Signed)..........................

RULE 5.

Refined copper may be delivered in ingots, ingot-bars, tiles, cakes, cathodes or wire-bars.

Cakes and wire-bars shall not weigh less than 100 lbs. and not more than 250 lbs. each

All copper must be delivered in bulk.

RULE 6.

All negotiable warehouse receipts for refined copper shall be accompanied by an assay certificate showing that the copper contents is not less than 99 per cent. electrolytic assay.

RULE 7.

For rough copper the standard of produce shall be 97 per cent., but no excess shall be paid for. A pro rata allowance on the settlement price shall be made for deficient produces below 97 per cent. down to and including 96 per cent. and a double pro rata allowance on the same basis for deficient produces below 96 per cent. down to and including 94 per cent. Produces below 94 per cent. shall not be a good delivery.

All certificates of rough copper shall state that the quality has been passed by the assayers as good merchantable.

RULE 8.

In delivering copper the seller shall deliver:

1. Invoice.
2. Weighers return.
3. Assay certificate.
4. Warehouse certificate (negotiable).

RULE 9.

Copper stored in warehouses at the port of New York shall be a good delivery.

The negotiable receipts of the following refineries shall be also a good delivery; but such receipts shall contain a clause, lighterage free to New York.

Raritan Copper Works.
Perth Amboy Works of the Am. S. & R. Co.
Nichols Copper Co.
Balbach S. & R. Co.
U. S. Metals Refining Co.

RULE 10.

Should any standard copper subsequently to tendering, prove to be of such quality as not to constitute a valid tender under the rules, buyers shall be entitled to call upon sellers (by giving notice to them in writing, as soon as practicable) to substitute a similar quantity of standard copper of the quality stipulated by the rules, and such substitution shall be made not later than 2.30 P. M. on the first business day following the notice of rejection of the original parcel or parcels. Should the contract be for a special brand, or brands, sellers shall, if possible, substitute the same brand, or brands, and of the proper quality as fixed by the rules; but if unable to thus substitute, and in cases where it becomes a question of special damages the dispute shall be settled by arbitration, according to the rules.

RULE 11.

SEC. A.—On all transactions on the floor of the exchange, commission shall be charged and paid whenever a member of this exchange transacts business for another party, whether said party is a member of this exchange or not, upon the purchase and sale of contracts for future delivery, and where a "turn" involves two transactions, viz.: a purchase and a sale, a commission must be charged on both. This rule applies also to extension or transfer of contracts from one month to another.

SEC. B.—The following shall be the minimum rates:

One dollar per ton for each and every ton of standard copper, bought or sold, when the transaction is made for any party not a member of this exchange.

Fifty cents per ton for each and every ton of standard copper, bought or sold, when the transaction is made for any member of this exchange, but carried in the name of the member making the transaction.

Twenty-five cents per ton for each and every ton of standard copper, bought or sold, when the transaction is made for any member of this exchange, but carried in the name of the member making the transaction.

Twenty-five cents per ton for each and every ton of standard copper, bought or sold, when the transaction is made for a member of this exchange, and his name given up and accepted on the day the transaction is made.

Twelve and one-half cents per ton for each and every ton of standard copper, for receiving and delivering the same.

SEC. C.—All commissions shall be due and payable as soon as the services shall have been rendered.

SEC. D.—The above-mentioned rates shall be in each and every case the minimum that may be charged by any member of this exchange, and shall be absolutely net and free of all and any rebate or discount in any way, shape or manner, under penalty of expulsion from the exchange.

RULE 12.

These rules, being special rules for trading in standard copper, form a part of the general rules for trading in metals; and in conjunction with such general rules, shall govern all contracts for standard copper.

COPPER PRODUCTION

(Issued by the Copper Producers' Association.)

August 10, 1909.

		Pounds.
Stock of marketable copper of all kinds on hand at all points in the United States, July 1, 1909....		154,858,061
Production of marketable copper in the United States from all domestic and foreign **sources** during July, 1909..............................		118,277,603
Deliveries of marketable copper for consumption and export during July, 1909..................		150,539,057
Stock of marketable copper of all kinds on hand at all points in the United States, August 1, 1909		122,596,607
Deliveries:		
For domestic consumption..........	75,520,083	
For export	75,018,974	
		150,539,057

METAL MARKET REVIEW

NEW YORK, August 9, 1909.

COPPER.—The London price for Standard Copper is about the same as a month ago, spot £58 15s., and futures £59 10s. The market abroad has been quiet, with slight fluctuations.

In the New York market prices at the close of July were about ⅛ lower than a month ago. Lake was offered at 13⅜, against 13½ at the end of June. Electrolytic was down to 12.80, against 13 cents, and Casting brands were down to 12.80, against 13 cents.

To-day, August 9, the Copper market is stronger again and prices have recovered the losses noted above. Lake is held

firmly at 13½, Electrolytic at 13 cents for spot and 10 to 15 points higher for futures. Casting brands continue scarce at around 13 cents.

The firmness in the Copper market to-day is due partly to the new method of trading on the New York Metal Exchange. On August 2 the Exchange started a daily call on Standard Copper, and spot and future sales were made of 225 tons on the first day's trading. The price of the future sales were from 15 to 25 points over the spot price, and this published advance of futures over spot Copper has given more strength to the general Copper market. Statistically the Copper market, taking London and America together, is in very bad shape and stocks continue to increase. The market can be manipulated by the leading selling agents for a time or for a prearranged play and the smaller sellers will follow on the same lines, but after each of these advances the market by its own load of stocks has sagged off again, and until the stocks show a further legitimate decline in the two markets it will hardly be possible for Copper to advance.

The statistics for the month of July are very interesting. The exports for the month are 35,046 tons, against 17,840 tons a year ago. With the exception of the exports in December 1907, the exports for July are the heaviest on record. The total exports for the seven months of this year now show an increase over the same period last year of 815 tons. According to the European statistics the visible supply of Copper in warehouse in England and France is 76,550 tons, the heaviest stock on record, an increase of 10,000 tons during the month; and compared with January 1 of this year the visible supply to-day is 21,000 tons larger.

The stock of Copper in France has not increased, and the stock in Germany is not included in these statistics. The whole increase is in the stock in warehouse in England, and these heavy stocks, of course, are the weak feature of the market.

Standard Copper to-day is quoted spot 12.75 bid, 13 cents asked, Lake Copper 13½ cents, Electrolytic 13 cents and Casting brands around 13 cents. Trading on the Metal Exchange in Standard Copper has been quite active since this method was started on August 2. Between 200 and 300 tons of Copper have been dealt in each day at from 12.75 spot to 13.15 paid for November in lots of 25 tons.

TIN.—The price of tin in the London market has advanced about £1 10s. during the month. Spot opened at £131 17s. bid and closed at £133 5s.

In New York prices show a net advance of about ¼ cent per pound.

The statistics for the month of July show an increase in the total visible supply of 2,000 tons. The deliveries into consumption were quite heavy, being estimated at 3,600 tons, against 3,200 tons during the month of June. The total shipments for the seven months this year were 1,222 tons less than the same period last year. The total deliveries in America for the seven months were 4,350 tons heavier than during the same period of 1908. The total visible supply to-day is about 4,000 tons heavier than a year ago.

The market closes with a general feeling of higher prices for the later months. Spot Tin to-day 5-10 ton lots 29.50; future 10 to 15 points higher.

LEAD.—The foreign Lead market has been dull and barely steady, closing at £12 12s. 6d., a net reduction of 5s. for the month.

In the New York market Lead has ruled rather easier during the month and prices declined about 5 points. At the close the market is fairly steady at 4.35 New York, carload lots.

In East St. Louis prices have declined about 15 points and outside lead, or lead from second hands and independent sellers has been offered at considerably below the Trust price. East St. Louis market to-day for carload lots, 4.20.

SPELTER.—The foreign price of Spelter has been fairly steady at around £22 all this month.

In the New York market there has been a better demand and prices are about 5 points higher than a month ago, closing at 5.45 New York delivery, carload lots.

In East St. Louis prices are about 5 points higher, closing at 5.35 carload lots.

ALUMINUM.—The price for domestic Aluminum has held steady at the nominal quotation of 24 cents. On larger lots the home makers have been meeting the prices of importers. The foreign Aluminum market has become very much firmer, owing to a proposed agreement to stop cutting prices to the bare cost of production. From sellers of foreign Aluminum as low as 20 cents in large lots the market has advanced to 21½ and in some quarters 22 cents for 5 or 10 ton lots or more. All future contracts carry a duty clause.

ANTIMONY.—The foreign market for Hallett's Antimony holds steady at around £30.

In the New York market there has been no change, and no interest shown in the article. The stocks here are very heavy, having been imported in anticipation of an advance of duty, and it is estimated we have enough Antimony over here for a year's supply. Cookson's, 8⅜; Hallett's, 7¾.

SILVER.—The London silver market has held very steady during the month within the range of 23d., opening at 23⅞d. and closing at 23 7/16d.

In the New York market silver shows a new decline for the month of 1⅛ cents, opening at 51⅞ and closing at 50¾.

QUICKSILVER.—We hear of no change in the foreign market. In the home market wholesale prices at $44 to $44.50, and for jobbing lots $45 to $46.50.

PLATINUM.—Prices unchanged at $22.50 for ordinary and $24.50 to $25.50 for hard.

SHEET METALS.—Sheet Copper is unchanged at 17-cent base, and wire at 15-cent base. Sheet Brass unchanged at 14 cents, with rods and wire at 14¼ base.

OLD METALS.—Prices for old metals are about the same as a month ago. Copper Scrap is dull. Dealers all complain of no business. White metals are inclined to be firmer.

THE JULY MOVEMENTS IN METALS

	Highest.	Lowest.	Average.
COPPER.			
Lake	13.50	13.37	13.50
Electrolytic	13.00	12.80	13.00
Casting	13.00	12.80	12.95
TIN	29.50	28.95	29.50
LEAD	4.35	4.30	4.35
SPELTER	5.35	5.20	5.30
ANTIMONY (Hallett's)	7.75	7.75	7.75
SILVER	.51⅞	.50¾	51.47

WATERBURY AVERAGE

The average price of lake copper per pound as determined monthly at Waterbury, Conn.

1909. Jan. 14⅜ Feb. 13¼ Mar. 12⅞ April 13 May 13¼ June 13½ July 13½.

NEW METAL TARIFF.

The new tariff act has become a law and we herewith give the duties on metals under the old and new laws:

	Old Law. Cts. per lb.	New Law. Cts. per lb.
Copper—Pigs, free, manufactured	2½	2½
Tin	free	free
Lead—Pigs, bars, and old	2½	2½
Lead—Sheet, pipes and wire	20%	2⅜
Spelter—Blocks, pigs and dust	1½	1⅜
Spelter—Sheets	2	1⅝
Aluminum—Crude	8	7
Aluminum—Plates, sheets, rods and bars	13	11
Antimony	¾	1½
Nickel—Ingot, cubes, etc.	6	6
Nickel—Sheet, strips and wire	6	35%
Manganese—(Metal)	20%	20%
Magnesium	free	3 & 25 %
Bismuth	free	free
Cadmium	"	"
Gold	"	"
Silver	"	"
Platinum	"	"
Quicksilver	7	7
Old Brass—Clippings	free	free

Trade Wants on Advertising Pages 38 to 40 Following

Metal Prices, August 6, 1909.

NEW METALS.

	Price per lb. Cents.
Copper—Pig, Bar and Ingot and Old Copper. Duty Free, Manufactured 2½c. per lb.	
Lake, car load lots	13.50
Electrolytic, car load lots	13.00
Casting, car load lots	13.00
Tin—Duty Free.	
Straits of Malacca, car load lots	29.50
Lead—Duty Pigs, Bars and Old, 2½c. per lb.; pipe and sheets, 2⅝c. per lb.	
Pig lead, car load lots	4.35
Spelter—Duty 1⅜c. per lb. Sheets, 1⅝c. per lb.	
Western, car load lots	5.45
Aluminum—Duty Crude, 7c. per lb. Plates, sheets, bars and rods, 11c. per lb.	
Small lots	28.00
100 lb. lots	25.00
Ton lots	24.00
Antimony—Duty 1½c. per lb.	
Cookson's, cask lots, nominal	8.35
Hallett's, cask lots	7.75
Other cask lots	7.60
Nickel—Duty Ingot, 6c. per lb. Sheet, strips and wire 35% ad valorem.	
Shot, Plaquettes, Ingots, Blocks, according to quantity	.45 to .60
Manganese Metal—Duty 20%	.80
Magnesium Metal—Duty 3 cents per pound and 25% ad valorem	$1.30
Bismuth—Duty free	1.80
Cadmium—Duty free	1.00
	Price per oz.
Gold—Duty free	$20.67
Silver—Duty free	50⅞
Platinum—Duty free	**22.50**
Quicksilver—Duty 7c. per lb. Price per pound	60c. to 61c.

OLD METALS.

Dealers' Buying prices. Cents per lb.		Dealers' Selling prices. Cents per lb.
11.50 to 12.00	Heavy Cut Copper	12.50 to 12.75
11.25 to 11.50	Copper Wire	12.25 to 12.50
10.00 to 10.50	Light Copper	11.00 to 11.25
10.75 to 11.25	Heavy Mach. Comp.	12.00 to 12.50
8.00 to 8.50	Heavy Brass	9.00 to 9.25
6.00 to 6.50	Light Brass	7.00 to 7.25
7.50 to 8.00	No. 1 Yellow Brass Turnings	8.25 to 8.50
8.50 to 9.00	No. 1 Comp. Turnings	9.50 to 10.00
4.00 to 4.20	Heavy Lead	4.25 to 4.30
3.50 to 3.62½	Zinc Scrap	3.62½ to 3.87½
5.00 to 6.00	Scrap Aluminum, turnings	5.00 to 6.75
10.00 to 12.00	Scrap Aluminum, cast, alloyed	11.00 to 13.00
14.00 to 15.00	Scrap Aluminum, sheet (new)	16.00 to 18.00
	Silicon Copper 10% to 20%....according to quantity	28 to 35
	Silicon Copper, 30%, guaranteed " "	— to 38

INGOT METALS.

	Price per lb. Cents.
Silicon Copper, 10% to 20%....according to quantity	28 to 35
Silicon Copper, 30%, guaranteed " "	38
Phosphor Copper, 5% " "	19 to 21
Phosphor Copper, 10% to 15%, guaranteed " "	28 to 30
Manganese Copper, 30% " "	30 to 35
Phosphor Tin " "	34 to 36
Brass Ingot, Yellow " "	9 to 10
Brass Ingot, Red " "	12 to 13
Bronze Ingot " "	11 to 12
Manganese Bronze " "	17 to 19
Phosphor Bronze " "	13 to 16
Casting Aluminum Alloys " "	29 to 35

Phosphorus—Duty 18c. per lb.
According to quantity.......... 30 to 35

PRICES OF SHEET COPPER.

BASE PRICE, 17 Cents per Lb. Net.

PRICES MENTIONED BELOW ARE FOR QUANTITIES OF 100 LBS. AND OVER.

SIZE OF SHEETS.		64 oz. and over 50 lb. sheet 30 x 60 and heavier.	32 oz. to 64 oz. 25 to 50 lbs. sheet 30 x 60.	24 oz. to 32 oz. 18¾ to 25 lb. sheet 30 x 60.	16 oz. to 24 oz. 12½ to 18¾ lb. sheet 30 x 60.	14 oz. and 15 oz. 11 to 12½ lb. sheet 30 x 60.	12 oz. and 13 oz. 9½ to 11 lb. sheet 30 x 60.	10 oz. and 11 oz. 7¾ to 9½ lb. sheet 30 x 60.	8 oz. and 9 oz. 6¼ to 7¾ lb. sheet 30 x 60.	Lighter than 8 oz.
		Cents Per Pound Over Base Price for Soft Copper.								
Not wider than 30 ins.	Not longer than 72 inches.	Base	Base	Base	Base	1	2	3	6	9
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	1	3	6	9	
	Longer than 96 inches.	"	"	"	"	2	6			
Wider than 30 ins. but not wider than 36 inches.	Not longer than 72 inches.	"	"	"	"	2	4	7	10	
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	2	6	9		
	Longer than 96 inches. Not longer than 120 inches.	"	"	"	1	3				
	Longer than 120 inches.	"	"	1	2					
Wider than 36 ins. but not wider than 48 inches.	Not longer than 72 inches.	"	"	1	2	4	7	10		
	Longer than 72 inches. Not longer than 96 inches.	"	"	1	3	5	8			
	Longer than 96 inches. Not longer than 120 inches.	"	"	2	4	8				
	Longer than 120 inches.	"	1	3	6					
Wider than 48 ins. but not wider than 60 inches.	Not longer than 72 inches.	"	Base	1	3	6	11			
	Longer than 72 inches. Not longer than 96 inches.	"	"	2	4	9				
	Longer than 96 inches. Not longer than 120 inches.	"	1	3	6					
	Longer than 120 inches.	1	2	4	8					
Wider than 60 ins. but not wider than 72 ins.	Not longer than 96 inches.	Base	1	3	8					
	Longer than 96 inches. Not longer than 120 inches.	"	2	5	10					
	Longer than 120 inches.	1	3	8						
Wider than 72 ins. but not wider than 108 ins.	Not longer than 96 inches.	1	3	6						
	Longer than 96 inches. Not longer than 120 inches.	2	4	7						
	Longer than 120 inches.	3	5	9						
Wider than 108 ins.	Not longer than 132 inches.	4	6							
	Longer than 132 inches.	5	8							

The longest dimension in any sheet shall be considered as its length.

CIRCLES, SEGMENTS AND PATTERN SHEETS, advance over prices of Sheet Copper required to cut them from. 3 cents per pound.

COLD OR HARD ROLLED COPPER, 14 oz. per square foot, and heavier, add.......... 1 " " "

COLD OR HARD ROLLED COPPER, lighter than 14 oz., per square foot, add.......... 2 " " "

POLISHED COPPER, 20 INCHES WIDE and under, advance over price for Cold Rolled Copper of corresponding dimensions and thickness.......... 1 " " sq. ft.

POLISHED COPPER, WIDER THAN 20 INCHES, advance over price for Cold Rolled Copper of corresponding dimensions and thickness.......... 2 " " " "

COLD ROLLED COPPER, PREPARED SUITABLE FOR POLISHING, same as Polished Copper of corresponding dimensions and thickness.

COLD ROLLED AND ANNEALED COPPER SHEETS OR CIRCLES, same price as Cold or Hard Rolled Copper of corresponding dimensions and thickness.

ROUND COPPER ROD, ⅜ inch diameter or over..........Base Price.
(Rectangular, Square and Irregular Shapes, Copper Rod, Special Prices.)

ZINC—Duty, sheet, 1⅝c. per lb.	Cents per lb.
Carload lots, at mill	7.25 less 8%
Casks	7.75
Open casks	8.25

Metal Prices, August 6, 1909

PRICES ON BRASS MATERIAL—MILL SHIPMENTS.

In effect June 21, 1909, and until further notice.

To customers who purchase less than 40,000 lbs. per year and over 5,000 lbs. per year.

	Net base per lb. High Brass.	Low Brass.	Bronze.
Sheet	$0.13½	$0.15½	$0.17
Wire	.13¾	.15¾	.17¼
Rod	.13¾	.15¾	.18¼
Brazed tubing	.19⅝	——	.21½
Open seam tubing	.17⅝	——	.19½
Angles and channels, plain	.17⅝	——	.19½

50% discount from all extras as shown in American Brass Manufacturers' Price List No. 7.

NET EXTRAS FOR QUALITY.

Sheet—Extra spring, drawing and spinning brass	½c.	per lb. net advance
" —Best spring, drawing and spinning brass	1½c.	" " " "
Wire—Extra spring and brazing wire	½c.	" " " "
" —Best spring and brazing wire	1c.	" " " "

To customers who purchase less than 5,000 lbs. per year.

	Net base per lb. High Brass.	Low Brass.	Bronze.
Sheet	$0.14½	$0.16½	$0.18
Wire	.14¾	.16¾	.18¼
Rod	.14¾	.16¾	.19¼
Brazed tubing	.20⅝	——	.22½
Open seam tubing	.18⅝	——	.20½
Angles and channels, plain	.18⅝	——	.20½

5% discount from all extras as shown in American Brass Manufacturers' Price List No. 7.

NET EXTRAS FOR QUALITY.

Sheet—Extra spring, drawing and spinning brass	½c.	per lb. net advance.
" —Best spring, drawing and spinning brass	1½c.	" " " "
Wire—Extra spring and brazing wire	½c.	" " " "
" —Best spring and brazing wire	1c.	" " " "

BARE COPPER WIRE—CARLOAD LOTS.

15c. per lb. base.

SOLDERING COPPERS.

300 lbs. and over in one order	18½c. per lb. base.
100 lbs. to 300 lbs. in one order	19c. " " "
Less than 100 lbs. in one order	20½c. " " "

PRICES FOR SEAMLESS BRASS TUBING.

From 1¼ to 3½ in O. D. Nos. 4 to 13 Stubs' Gauge, 18c. per lb.
Seamless Copper Tubing, 22c. per lb.

For other sizes see Manufacturers' List.

PRICES FOR SEAMLESS BRASS TUBING Iron Pipe Sizes.

Iron Pipe Size	⅛	¼	⅜	½	¾	1	1¼	1½	2	2½	3	3½	4	4½	5	6
Price per lb.	26	25	20	19	18	18	18	18	18	18	18	19	20	22	24	25

PRICE LIST OF IRON LINED TUBING—NOT POLISHED.

	Per 100 feet Brass.	Bronze.
⅜ inch	$8	$9
½ inch	8	9
⅝ inch	10	11
¾ inch	12	13
⅞ inch	14	15
1 inch	18	20
1⅛ inch	22	24
1¼ inch	25	27
1½ inch	32	35
1¾ inch	45	48
2 inch	56	60

Discount 45 and 5%.

PRICES FOR MUNTZ METAL AND TOBIN BRONZE.

Muntz or Yellow Metal Sheathing (14" x 48")	14c. lb. net base
" " " Rectangular sheets other than Sheathing	16c. " " "
" " " Rod	15c. " " "
Tobin Bronze Rod	16c. " " "

Above are for 100 lbs. or more in one order.

PLATERS' METALS.

Platers' bars in the rough 22¼c. net.

German silver platers' bars dependent on the percentage of nickel, quantity and general character of the order.

Platers' metal, so called, is very thin metal not made by the larger mills and for which prices are quoted on application to the manufacturers.

PRICES FOR SHEET BLOCK TIN AND BRITANNIA METAL.

Not over 18 in. in width, not thinner than 23 B. S. Gauge, 4c. above price of pig tin in same quantity.

Not over 35 in. in width, not thinner than 22 B. S. Gauge, 5c. above price of pig tin.

PRICE LIST FOR SHEET ALUMINUM—B. & S. Gauge.

Wider than / and including	3in. / 12in. in coils.	6in. / 14in.	14in. / 16in.	16in. / 18in.	18in. / 20in.	20in. / 24in.	24in. / 30in.	30in. / 36in.	36in. / 40in.
No. 13 and heavier	34	34	36	36	36	36	39	39	39
" 14	34	34	36	36	36	36	39	39	39
" 15	34	34	36	36	36	36	39	39	39
" 16	34	34	36	36	36	36	39	39	39
" 17	34	34	36	36	36	36	39	39	39
" 18	34	34	36	36	36	36	39	39	42
" 19	34	34	36	36	36	36	39	40	43
" 20	34	36	36	36	36	38	41	42	44
" 21	34	38	38	38	38	40	43	44	50
" 22	34	38	38	38	40	40	43	47	51
" 23	34	38	38	38	40	40	43	49	52
" 24	34	38	40	42	42	42	45	51	54
" 25	36	39	41	43	43	43	46	53	57
" 26	36	39	42	46	46	46	51	55	61
" 27	36	40	44	48	48	49	54	58	64
" 28	36	40	46	48	49	49	56	62	67
" 29	38	41	48	50	52	52	61	67	72
" 30	38	42	50	52	56	62	69	72	77
" 31	43	47	55	58	63	71	74	77	83
" 32	45	49	57	61	69	77	91	90	95
" 33	47	51	60	65	73	84	91	100	110
" 34	50	55	62	70	78	91	103	110	120
" 35	..	65	70	80	90	100	115	125	..
" 36	..	80	90	100	115	120	135	..	..
" 37	..	104	114	129	144	159	174	..	..
" 38	..	124	139	154	169	184	204	..	..
" 39	..	144	164	184	204	224	..	..	..
" 40	..	174	204	224	244	..	..	..	..

In flat rolled sheets the above prices refer to lengths between 2 and 3 feet. Prices furnished by the manufacturers for wider and narrower sheet. All columns except the first refer to flat rolled sheet. Prices are 100 lbs. or more at one time. Less quantities 5c. lb. extra. Charges made for boxing.

PRICE LIST SEAMLESS ALUMINUM TUBING.

STUBS' GAUGE THE STANDARD. SIZES CARRIED IN STOCK.
Outside Diameters. BASE PRICE, 25 Cents per Pound.

Stubs' Gauge.	Inches.	¼ in.	5-16 in.	⅜ in.	½ in.	⅝ in.	¾ in.	⅞ in.	1 in.	1¼ in.	1½ in.	1¾ in.	2 ins.	2½ ins.	3 ins.	3½ ins.	4 ins.	4½ ins.
11.	.120.	..	..	..	..	..	..	..	26	23	..	..	13	11	9	8	15	22
12.	.109.	..	..	..	..	..	..	..	25	..	..	..	14	..	..	..	..	..
14.	.083.	..	..	..	..	..	..	..	..	..	..	..	16	..	..	..	..	..
16.	.065.	..	..	..	..	..	27	26	26	23	22	20	20	29	20	26	30	56
18.	.049.	..	..	..	..	32	29	28	27	24	25	25	25	..	..	..	..	..
20.	.035.	116	..	45	38	33	32	31	29	28	29	29	29	30	37	48	57	80
21.	.032.	..	..	..	39	..	..	..	..	..	..	..	..	..	..	..	..	..
22.	.028.	137	97	47	41	37	36	34	33	..	..	44	..	..	..	..	..	..
24.	.022.	187	132	107	87	78	72	61	59	65	..	..	..	..	..	..	..	..

Prices are for ten or more pounds at one time. For prices on sizes not carried in stock send for Manufacturers' List.

PRICE LIST FOR ALUMINUM ROD AND WIRE.

Diameter. B. & S. G'ge.	000 to No. 10.	No. 11.	No. 12.	No. 13.	No. 14.	No. 15.	No. 16.	No. 17.	No. 18.	No. 19.	No. 20.	No. 21.	No. 22.
Price, per lb. ...	32	32½	32½	33	33½	34	34½	35	36	37	38	43	46

200 lbs. to 30,000 lbs., 3 cents off list; 30,000 lbs. and over, 4 cents off list.

PRICE LIST FOR GERMAN SILVER IN SHEETS AND ROLLS.

Per cent.	Price per lb.	Per cent.	Price per lb.
12	$0.52	16	$0.58
13	.53	17	.59
14	.54	18	.60
15	.55		

These prices are for sheets and rolls over 2 inches in width, to and including 8 inches in width and to No. 20, inclusive, American or Brown & Sharpe's Gauge. Prices are for 100 lbs. or more of one size and gauge in one order. Discount 50%.

GERMAN SILVER TUBING.

4 per cent. to No. 19, B. & S. Gauge, inclusive	$0.60
6 " " 19, " " "	.70
9 " " 19, " " "	.85
12 " " 19, " " "	1.00
15 " " 19 " " "	1.15
16 " " 19, " " "	1.20
18 " " 19, " " "	1.30

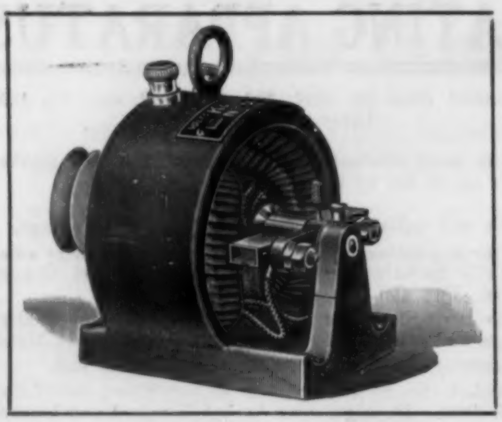
German Silver Tubing thinner than No. 19 B. & S. Gauge add same advances as for Brazed Brass Tube.

For cutting to special lengths add same advances as for Brazed Brass Tube. Discount 40%.

PRICE OF SHEET SILVER.

Rolled sterling silver .925 fine is sold according to gauge quality and market conditions. No fixed quotations can be given as prices range from 2c. below to 6c. above the price of bullion.

Rolled silver anodes .999 fine are quoted at 2c. to 3c. above the price of bullion.



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High-Grade

Efficient

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Smoothly finished in black **enamel**—not paint. At 2200 R.P M. it generates a current of 2 volts, 6 amperes, with **regular** winding. It may be wound to increase the amperes up to 15 without extra cost - **Price, $8.00**

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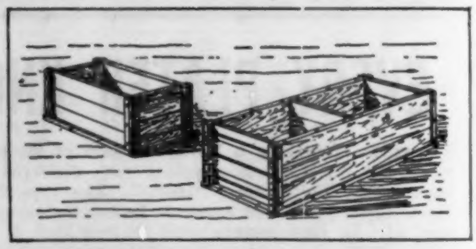

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